SITE EVALUATION

80 LISTER AVENUE

SUBMITTED TO

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

PREPARED BY

DIAMOND SHAMROCK CHEMICALS COMPANY
IT CORPORATION
WOODWARD-CLYDE CONSULTANTS
ENVIRO-MEASURE, INC.

FEBRUARY 1985

VOLUME I

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF TABLES
(Continued)

LIST OF TABLES
(Continued)

LIST OF TABLES
(Continued)

LIST OF TABLES
(Continued)

LIST OF TABLES
(Continued)

LIST OF TABLES
(Continued)

LIST OF FIGURES

LIST OF FIGURES
(Continued)

LIST OF FIGURES
(Continued)

LIST OF FIGURES
(Continued)

EXECUTIVE SUMMARY

The property located at 80 Lister Avenue in the Ironbound section of Newark, New Jersey is a former chemical manufacturing facility operated by a number of firms, including Diamond Shamrock Chemicals Company (Diamond Shamrock). An investigation conducted by the New Jersey Department of Environmental Protection (NJDEP) and the U.S. Environmental Protection Agency (EPA) confirmed in May 1983 the presence of dioxin at the 80 Lister Avenue property. Diamond Shamrock entered into a consent order agreement with NJDEP in March 1984, agreeing to secure the site, to take measures to minimize public exposure to contamination, and to undertake a site evaluation and a feasibilty study of remedial alternatives. This report documents the site evaluation.

As part of the site evaluation, a Work Plan was prepared and submitted to NJDEP in June 1984. The Work Plan was modified in response to NJDEP comments and the amended Work Plan was approved in August 1984. A field investigation was subsequently conducted at the site between September and November 1984. Analytical laboratory testing has been performed on the various samples obtained at the site and the results are reported herein along with the results of other testing and other site characterization data.

Chemical manufacture at the 80 Lister Avenue site began in the early part of this century, but the period of most significance relative to the contamination observed at the site is from the end of World War II to the mid-1970's. During this time pesticides and phenoxy herbicides were the primary products manufactured, and dioxin occurs as a contaminate in some of these products.

The purpose of the site evaluation is to define the levels of dioxin and priority pollutants on the plant site. As used herein, priority pollutants refers to 157 compounds in the acid/base/neutral organics (semi-volatile), volatile organics, pesticides and PCB's, herbicides, metals, total cyanide, and total phenol analyses plus the 40 extraneous peak searches.

The site evaluation was carried out in accordance with health and safety plans, sampling and handling protocols, quality assurance and quality control procedures, analytical procedures, and decontamination requirements specified in the Work Plan.

A total of 1,540 samples were collected during the site field investigation. Sample types included:

- Chip, wipe, and bulk samples from existing buildings, structures, tanks, vessels, and sewers
- Samples of surface soils, near-surface soils, and soils at depth
- Samples of ground water beneath the site
- Samples of both Passaic River water and sediment.
- Ambient air samples with the site analyses compared to the New Jersey Airborne Toxic Elements and Organic Substances studies.
- Samples of the existing on-site drummed material
- Industrial hygiene samples encompassing both atmospheric samples (personnel monitoring) and wipe samples (decontamination confirmation)
- Quality assurance/quality control related blanks, splits, spikes, and duplicates
- Samples of background soils from off-site locations.

A number of these samples including drums, tanks, and subsurface soils accounting for 877 of the total samples collected were archived. The other 663 samples were analyzed for one or more of the following parameters as specified by the Work Plan:

- 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD or dioxin)
- Volatile priority pollutants (38 compounds)
- Semi-volatile priority pollutants (69 compounds)
- Pesticides/herbicides (35 compounds)
- Inorganic/classical parameters (15 compounds)
- 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF)
- Octachlorodibenzo-p-dioxin (OCDD)
- Asbestos
- Various ambient air/industrial hygiene parameters.

Results of the chemical analyses confirmed the presence of dioxin and a limited number of priority pollutant compounds on the site. Generally, the priority pollutant compounds detected with the greatest frequency and in the highest concentrations were those chemicals associated with previous site operations.

The site evaluation has established the following:

- Dioxin is present both inside and outside all the site structures, with the highest level of contamination in the process and chemical manufacturing buildings. Because of the extent of contamination and materials of construction, decontamination is impractical.
- Approximately 70 percent of the existing on-site drums are contaminated with dioxin.
- All of the tanks, sewers, and sumps sampled are contaminated with dioxin.

- The surficial fill layer beneath the site is contaminated with dioxin and process-related chemicals related to previous site chemical handling and production. All samples collected to a depth of two feet had positive dioxin results.

- Samples of the silt layer from the northern portion of the site had low-level dioxin contamination.

- The ground water in the surficial (fill zone) aquifer is contaminated with dioxin and process related chemicals related to previous site chemical handling and production.

- Dioxin is present in the Passiac River sediments. The dioxin concentration increases with depth.

In order to successfully complete a feasibility study for remedial action, additional information is necessary. Recommended supplemental activities to provide this information include:

- Analysis of archived soil samples from both the fill and silt layer to define the vertical extent of contamination. Depending on the results, a geostatistical model would be used to optimize additional sample locations for an extended boring program.

- The subsurface hydrogeology, especially those aquifers underlying the silt layer, need to be further defined by the installation of deeper monitoring wells.

- A more extensive river sediment sampling program is required to define the lateral and vertical extent of contamination. Data from a recently completed hydrographic survey of the river can be used in the preparation of this program.

1.0

1.0 INTRODUCTION

This report presents the results of the site evaluation conducted at the 80 Lister Avenue site (hereinafter "the site"). The work has been performed for Diamond Shamrock Chemicals Company (Diamond Shamrock) by IT Corporation (ITC), and its subcontractors--Woodward-Clyde Consultants (WCC) and Enviro-Measure, Inc. (EMI). This report is being submitted to the New Jersey Department of Environmental Protection (NJDEP) in response to Administrative Consent Order I (ACO I) related to the site.

The report describes in detail the history of the site, the regional environmental setting, and all the activities associated with the site evaluation as defined in the 80 Lister Avenue Work Plan (Work Plan). Data associated with the field sampling and testing and analytical laboratory testing are presented, and these data are subsequently used to characterize the site with respect to the presence of 2,3,7,8-TCDD (dioxin) and the U.S. Environmental Protection Agency (EPA) priority pollutants plus 40 tentatively identified nonpriority pollutants in the volatile organic analysis, base/neutral, and acid fractions for each sample analyzed. Finally, the available information characterizing the site is evaluated to determine if an adequate data base exists for performing a feasibility study for remedial action. The following paragraphs describe the main sections of the report in more detail.

Section 2.0 presents the history of the site from its earliest known use as an industrial site to its current condition. Particular emphasis has been placed upon the period during which the hazardous materials known to be present were manufactured. A history of events leading to the site evaluation presented herein is also provided.

Section 3.0 presents the regional environmental setting of the site covering climate and meteorology, geology and landforms, surface and ground water hydrology, flora and fauna, and land usage. Specific climatic data provided include wind speed and direction and corresponding durations, mean and extreme temperatures and precipitation, and evaporation levels. Regional physiography, geology, and hydrogeology are described because of their effect upon the potential migration of contaminants in the ground water. Surface hydrology is also discussed. Data on flora and fauna and surrounding land usage are provided as a basis for evaluation of possible adverse effects due to the contaminants at the site.

The evaluation program conducted at the site is defined in Section 4.0. This includes a description of general activities such as industrial hygiene, sample handling and documentation, quality assurance/quality control (QA/QC), and the analytical laboratory methods used. Reference is made to the Work Plan where many of these items have already been discussed in detail. The specific sampling methodology used for buildings, soils, sediments, river water, ground water, drums, etc. is also provided. Again, reference is made to the Work Plan to avoid unnecessarily long descriptions. All instances of deviation from the procedures defined in the Work Plan are carefully documented.

Section 5.0 presents the data obtained from the site evaluation program. Generally, the data are presented in the form of summary tables with the complete data presented in appendices to the report. This section is organized in a manner similar to Section 4.0, where the various sampling and analytical methods are described.

Section 6.0 provides a characterization of the site based on the data provided in Section 5.0. The characterization includes ambient air, process waste (drums, tanks, etc.), facilities, soils, ground water, and the Passaic River water and sediments. The extent of contamination of each of the preceding is defined to the extent permitted by the data.

An evaluation of the results of the investigation of the site is provided in Section 7.0. The data are carefully examined from the standpoint of providing an adequate definition of contamination of the items characterized in Section 6.0, particularly with regard to adequacy for performing a feasibility study. Areas of deficiency are clearly identified and a recommended program for obtaining any required additional data is presented.

References, tables, and figures for each section are provided at the end of that section. Tables and figures are numbered sequentially according to the section of the text in which they are first referenced. For example, the first two tables referenced in Subsection 2.6.2 would be 2.6.2-1 and 2.6.2-2. Appendices are presented sequentially at the end of the report and are identified by letters (Appendix A, Appendix B, etc.). A list of the material contained in each appendix is provided at the beginning of that appendix. The report Table of Contents is provided at the front of each of the volumes of the report.

2.0

2.0 SITE HISTORY AND EXISTING CONDITIONS

2.1 SITE LOCATION

The 80 Lister Avenue site is located in the Ironbound section of Newark, New Jersey. The site occupies approximately 3.4 acres on the north side of Lister Avenue. It is nearly rectangular in shape, extending about 375 feet in an east-west direction and 405 feet north-south. The site is bounded on the north by the Passaic River, on the east by the former Sergeant Chemical Company site now owned by Diamond Shamrock, at the southeast corner by the Duralac Company property, and on the south and west by Sherwin-Williams Company property. Vehicular access to the site is via a common right-of-way shared with Duralac and which enters the southeast corner of the property. The property is formally described as Lots 58 and 59 in Block 2438 on the tax maps of Newark.

The location of the site within Newark and the Ironbound section is shown on the accompanying maps (Figures 2.1-1 and 2.1-2).

2.2 SITE HISTORY

2.2.1 History Prior to Purchase by Diamond Shamrock

Industrial development on the site is reported to date from the 1870's. Drawings from 1914, revised in 1922, show the site to be part of the Lister Agricultural Chemical Company property which extended for some distance along the Passaic River. This plant site also included most of the other nearby industrial sites.

It was during the period of ownership by Lister that the site reached its present dimensions following filling along the south shore of the Passaic River to form the northernmost 30 percent of the property (Figure 2.2.1-1). Much of the remainder of the site is also filled with the granular material reportedly used to fill the marsh land that existed in the natural state. Several buildings were on the site including the

Lister power plant, which remains today as the chemical manufacturing building. The site and adjacent property were traversed by a system of 16- to 24-inch sewers and drains leading to the river--these, though now long abandoned, may still influence the movement of water across the property (Figure 2.2.1-2).

When Lister Agricultural Chemical Company ceased operations, the property was subdivided largely along the lines that form the present property boundaries and was sold. A 1.8-acre parcel (the northeast portion of the present site) was eventually acquired by the Kolker Chemical Works, Inc., which, by the mid-1940's, was operating an agricultural chemicals plant on the site--this was the beginning of the manufacturing operations that are related to the current conditions at the site.

Kolker was an early producer of both dichlorodiphenyltrichloroethane (DDT) and the phenoxy herbicides. The exact dates when manufacture started is not known, but it is believed that DDT production was underway before the end of World War II and that herbicide production started by 1948. In addition to DDT and the phenoxy herbicides, other products of interest made on the site included hexachlorobenzene (HCB), ovex (a miticide), Lindane and low γ-benzene hexachloride (low γ-BHC). Several derivatives of benzene sulfonyl chloride and sulfonates were also made, but these were all low volume products. In all cases, manufacture started with readily available raw materials and the principal intermediates were made on the site. Table 2.2.1-1 lists the raw materials and finished products reported to have been handled during the time that Kolker, Diamond Alkali, and Diamond Shamrock operated the plant.

The principal products made on the site by Kolker were DDT and the phenoxy herbicides with estimated total output of 100 and 110 million pounds, respectively. Production of other products is not believed to have significantly exceeded ten million pounds. Estimated output (where known) of the major products is provided in Table 2.2.1-2.

Ownership by Kolker ceased in March 1951 when the Kolker Chemical Works was acquired by Diamond Alkali Company (now Diamond Shamrock Chemicals Company).

2.2.2 History During Ownership by Diamond Alkali and Diamond Shamrock (March 1951 to March 1971)

During this period the manufacture of several products was either transferred to other locations or discontinued, leaving the phenoxy herbicides as the only products of the plant. A major impetus for this change was an explosion in February 1960 which destroyed several plant processes--when rebuilt the plant only included processes for the manufacture of the phenoxy herbicides and their intermediates. The layout of the plant site prior to the explosion is shown in Figure 2.2.2-1. Modernization and expansions continued during the 1960's which saw total phenoxy capacity more than double to 15 million pounds per year. Principal events during Diamond Shamrock and subsequent ownership are listed in Table 2.2.2-1.

The changes started in 1955 with the transfer of Lindane manufacture to another location. Production of low γ-BHC continued until 1957 or 1958 when it also was relocated. The biggest change, however, was the transfer of DDT production, which was moved to Texas in late 1958 or early 1959. During the late 1950's several process changes were instituted to improve the operating efficiency of the plant. Among these was a change instituted around 1956 to the trichlorophenol (TCP) process to recycle trichloroanisole (TCA). A change in the handling of process effluent also occurred in 1956 with the installation of an industrial sewer connecting to the Passaic Valley Sewerage Commission (PVSC) Lister Avenue line. Following installation of that connection, most of the plant process wastes were discharged through the PVSC treatment plant.

An explosion in the TCP unit during February 1960 destroyed the large five-story building in which it and several other plant processes had been located. Following the explosion, a decision was made to limit future production to the phenoxy herbicides, ending output of HCB, ovex and the benzene sulfonyl chloride derivatives.

A larger site was required for rebuilding the plant on the scale desired, so an adjacent 1.6-acre parcel (consisting of the southwest portion of the present site) was leased from the Triplex Oil and Refining Company (later Walter Ray Holding Company). This site, which had been used for reclaiming oil, contained several buildings and large tanks which were razed to permit installation of a new laboratory and office building, a maintenance shop/warehouse building, and a tank farm for flammable raw materials along the west side of the property. The relationship between the original Diamond Shamrock property and the land leased from Triplex is shown in Figure 2.2.1-1.

Following demolition of the remains of the damaged building, a new process building devoted to the manufacture of sodium trichlorophenol (NaTCP), 2,4-dichlorophenol (2,4-DCP), monochloroacetic acid (MCA), and by-product hydrochloric acid (HCl) was erected along the river near what had been the north end of the old building. Following this construction, the manufacture of the intermediates was carried out in the new buildings, leaving the old but undamaged chemical manufacturing building for the production of 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), and their esters and amines. The layout of the plant, as reconstructed, and in approximately its present configuration is shown in Figure 2.2.2-2.

The process building remains largely unchanged to this day--the only addition was equipment installed in 1967 to purify the NaTCP by removing dioxin. The period 1963 to 1967 saw several major projects in the 2,4-D and 2,4,5-T manufacturing areas which were designed to improve working conditions, improve product quality, and expand capacity. Most significant among these changes were:

- 1963 - The 2,4-D acid process was rehabilitated. The roof was raised permitting installation of new ventilating ducts to carry process fumes to a new and larger caustic scrubber.
- 1965 - The melt, washing, and drying process for the production of dry, flaked 2,4-D was installed, with a 40 percent increase in capacity. These changes also reduced personnel contact with the 2,4-D.
- 1967 - The final plant expansion saw the construction of a new and larger 2,4-D unit and the conversion of the former 2,4-D unit to the manufacture of 2,4,5-T. The TCP purification process for dioxin removal via carbon filtration was added as part of this same expansion.

Operation at the plant continued until August 1969 when it was shut down. The production units were cleaned out as they were shut down, and between September and December the remaining raw materials and products were sold and shipped. The plant was listed for sale and remained idle thoughout 1970 until it was purchased by Chemicaland Corporation in March 1971. It is noted that Chemicaland actually purchased the 1.8 acres and improvements owned by Diamond Shamrock, which then assigned rights to the 1.6 acres it had leased from Walter Ray Holding Company to Chemicaland.

2.2.3 History During Chemicaland and Subsequent Ownership (March 1971 to the Present)

Following purchase of the property by Chemicaland, equipment was installed for the manufacture of benzyl alcohol which was to be made and sold by Cloray NJ Corporation, an affiliate of Chemicaland. Production of benzyl alcohol was not profitable, so they attempted to expand their product line by manufacturing several specialty items and also by performing custom manufacture on a toll basis. These efforts were all unsuccessful and production ceased during the summer of 1973.

In September 1973, Chemicaland contracted to produce 2,4-D on a toll basis and started rehabilitating the plant so that it could again make 2,4-D. Rehabilitation of the plant was completed sometime during the spring of 1974 and production of 2,4-D resumed. Limited quantities of 2,4-D were produced during the summer of 1974, but none was delivered to Diamond Shamrock under the contract. Operations were suspended and the plant staff was laid off in September 1974.

Arrangements were then made by Chemicaland to produce 2,4-D on a toll basis for a second time and work resumed in February 1975. Limited quantities of 2,4-D were being produced by April 1975. Production of 2,4-D continued for the next 22 months, but output varied widely. Chemicaland scavenged equipment from unused processes such as TCP purification and 2,4,5-T for use in their 2,4-D unit and made temporary repairs to bypass failed equipment. The only major addition to the process known to have been made by Chemicaland was the installation of a second 2,4-D reactor during May 1976. However, this addition was soon negated by the failure of the original reactor. The maximum monthly output of 2,4-D by Chemicaland was reported to be about 500,000 pounds.

In November 1976, while they were considering acquisition of Chemicaland, Occidental Chemical Company assumed control of the management of the plant and continued to manage the plant until February 24, 1977, when they returned control of the plant to Chemicaland. Because Chemicaland did not have the resources to continue operating without the support of Occidental, they laid off all plant personnel and shut down the plant as it was on the morning of February 24, 1977.

The property remained idle through 1980, but the ownership changed as William Leckie (the successor to Walter Ray Holding Company) purchased the 1.8 acres owned by Chemicaland in a tax sale, consolidating ownership in his name. In March 1981 Leckie sold the site to Marisol, Inc.

Little is known of the use of the property by Marisol, but eventually this company started cleaning and clearing the site. Concerning the cleanup, it is known that:

- The product left in the equipment when the plant was shut down on February 24, 1977, was removed and placed in drums, of which 570 remain on site today.
- Some equipment known to be on the site following the shutdown was removed.
- Warehouse space and tankage was leased to SCA Corporation which used it in conjunction with waste disposal operations at their neighboring plant. The date that SCA started to use the site is not exactly known, but was prior to the summer of 1982.

During the spring of 1983, SCA continued to lease and use a portion of the site, while Marisol was working to prepare the office building for occupancy. This was the situation in May 1983 when results of samples taken in April by the EPA showed high levels of dioxin on the site and NJDEP moved to control access to the property. On June 2, 1983, New Jersey Governor Kean issued Executive Order No. 40 which has guided control and cleanup activities since that date.

2.3 GENERAL PROCESS DESCRIPTION

The processes described in the following paragraphs relate to the manufacture of 2,4-D and 2,4,5-T and their intermediates at the time the plant was shut down by Diamond Shamrock. These processes are most relevant to the current state of contamination at the site.

2.3.1 NaTCP

NaTCP was made in a batch reaction by the alkaline hydrolysis with caustic soda of 1,2,4,5-tetrachlorobenzene (T_4CB) in the presence of methanol at temperatures and pressures near 165 degrees Centigrade and 350 psig, respectively. Methanol was distilled from the reaction mass and recycled. The resulting NaTCP solution was then steam distilled to remove by-product TCA which also was recycled to the reactor. Following steam distillation, the NaTCP solution was diluted with water, then passed through a carbon bed to remove dioxin. The purified but dilute NaTCP solution was then reconcentrated for use in the 2,4,5-T process by acidifying two-thirds of the stream, then separating the TCP from the water to raise the TCP content to 93 percent. This concentrated TCP was neutralized with caustic soda to reform the NaTCP and then mixed with the remaining third of the diluted NaTCP, yielding NaTCP of the correct concentration for use in the manufacture of 2,4,5-T.

2.3.2 2,4-DCP

The direct chlorination of phenol in the presence of a ferric chloride catalyst was used to make 2,4-DCP. The reaction was carried out in batches at atmospheric pressure. Detailed chromatographic studies of the process to optimize the 2,4 content were correlated with the freezing point of the reaction mass, and the results were used as the routine means of process control. The 2,4-DCP was stored and handled as produced in the molten state.

2.3.3 MCA

MCA was made by the chlorination of a mixture of acetic acid and acetic anhydride in batches. Routine process control was again effected by measuring the freezing point of the product. MCA, similar to the 2,4-DCP, was stored and used in the molten state without dilution or purification.

2.3.4 HCl

HCl, produced as a by-product of the 2,4-DCP and MCA processes, was absorbed in water to form 32-percent muriatic acid, which was sold in the local area.

2.3.5 2,4-D

Production of 2,4-D was carried out in batches by the alkaline condensation of the 2,4-DCP and MCA in the presence of caustic soda. The resulting sodium 2,4-D slurry was filtered and washed to remove unwanted sodium 2,6-D which was discarded. The sodium 2,4-D was then continuously acidified with sulfuric acid, washed to remove sodium sulfate, and dried in an evaporator. The resulting anhydrous, molten 2,4-D was stored for later flaking or for use in the preparation of the various 2,4-D esters or Dacamines.

2.3.6 2,4-5-T

Production of 2,4,5-T was carried out by an analagous process to that used for the manufacture of the 2,4-D. All components of the process were operated in the same manner, although at slightly different temperatures and pressures.

2.3.7 Esters of 2,4-D and 2,4,5-T

The esters of both 2,4-D and 2,4,5-T were formed by batch reaction with the appropriate alcohol in the presence of sulfuric acid which acted as a catalyst. The alcohol and by-product water were distilled throughout the reaction and the alcohol was held for later reuse in the process. On completion of the reaction, the last traces of water were removed under vacuum, and the ester was then transferred to storage to await sale.

2.3.8 Amines of 2,4-D and 2,4,5-T

The water-soluble dimethylamine (DMA) salts of 2,4-D or 2,4,5-T were formed by the reaction of a water solution of DMA with either wet or dry 2,4-D or 2,4,5-T. The resulting amine salt solutions were adjusted for concentration and then stored for later sale. A proprietary line of oil-soluble amines (the Dacamines) was prepared by the reaction of N-oleyl-1,3 propylenediamine with either dry, molten D or T acids or the flaked acids.

2.4 PRESENT CONDITION OF THE PLANT

2.4.1 Buildings and Facilities

The manufacturing buildings, following 15 years with minimal maintenance and 8 years of sitting idle, are in very poor condition. Throughout the plant the carbon steel vessels are heavily rusted, with generally severe loss of metal. Stainless and other alloy vessels are in somewhat better condition. The buildings themselves exhibit extensive corrosion of the floor steel and other structural members, collapse of the roofs in several places, and acid attack of the concrete floors and the block or brick walls at many points. The roof of the boiler house is in imminent danger of collapsing, and bricks are falling from the 190-foot-high stack creating a hazard for those working below.

The office and laboratory building and the maintenance shop/warehouse building are in much better condition. These buildings show signs of leaking roofs and other evidence of inadequate maintenance and care, but they are structurally sound.

Most of the raw material tanks on the west side of the property and the product tanks on the east side of the property are in fairly good condition. The remaining intermediate storage tanks are in questionable condition (many have already been removed from the site). Decontamination water produced during the site evaluation field investigation has been stored in two 25,000-gallon tanks in the east tank farm.

Drums of material (a total of 570 drums) removed from the equipment and on-site sumps are stored at various locations throughout the two manufacturing buildings. Material collected by the U. S. Environmental Protection Agency (EPA) during some initial off-site remedial work and wastes collected during the site assessment are stored in drums in the warehouse.

2.4.2 Site Protection

An investigation conducted by NJDEP in May 1983 confirmed dioxin contamination as high as 51 ppm within the site boundaries. Following the discovery of dioxin on the site, Diamond Shamrock, at the direction of the NJDEP and EPA, took initial measures to control access to the property and reduce the possibility that dioxin-contaminated material could leave the property. The principal measures were:

- A fence was installed around the property including the river front.
- An around-the-clock security guard was placed at the only gate providing access to the property. The duty of the guard is to control entry onto the premises and restrict it to authorized personnel.
- The entire site, excepting areas covered by buildings and equipment, was covered by a permeable geotextile fabric (Amoco No. 2002 polypropylene stabilization fabric). This fabric was weighted down by concrete blocks to prevent movement by wind.

Some portions of the fabric were disturbed during the sampling for the site evaluation field investigation. Repairs were made immediately to reestablish the protective integrity originally provided for the site.

2.5 SITE INVESTIGATION

Diamond Shamrock entered into an administrative consent order with the NJDEP on March 13, 1984. The order requires that Diamond Shamrock undertake certain actions to secure the site, prevent exposure to contaminants, and determine the vertical and horizontal extent of chemical contamination. The initial phase of the order requires the preparation of a work plan, the completion of a site evaluation, and a feasibility study of remedial alternatives.

Diamond Shamrock submitted a Work Plan for the initial phase to the NJDEP on April 18, 1984. As a result of NJDEP review comments, the Work

Plan was revised and an addendum was submitted on June 20, 1984. Subsequently, NJDEP approved the amended Work Plan and it was implemented. Mobilization of equipment and personnel to the site along with initial remedial activities commenced August 20, 1984. The actual investigation/sampling effort was conducted from September 5, 1984 through October 26, 1984. Demobilization of personnel from the site was completed by November 16, 1984. The sampling and decontamination trailers were left on site in a winterized condition. The site security guard service has been maintained.

TABLES

TABLE 2.2.1-1

RAW MATERIALS AND FINISHED PRODUCTS DURING KOLKER, DIAMOND ALKALI, AND DIAMOND SHAMROCK OWNERSHIP

Raw Materials

Acetic acid
Acetic anhydride
*Acetaldehyde
*Benzene
*Monochlorobenzene
Tetrachlorobenzene
*Chlorosulfonic acid
Methanol
*Oleum (20%)
Phenol
Sulfuric acid
Dimethylamine (40%)
Triethylamine
Chlorine
2-Ethylhexanol
Butyl alcohol
Isopropyl alcohol
Butoxyethoxypropanol
*Nicotine
Sodium Hydroxide

Finished Products

2,4,5-trichlorophenoxy acetic acid
2,4-dichlorophenoxy acetic acid
2,4,5-trichlorophenol
2,4,6-trichlorophenol
2,4-dichlorophenol
Monochloroacetic acid
*Hexachlorobenzene
*Dichlorodiphenyltrichloroethane
*p-chlorophenyl-p-chlorobenzene sulfonate (ovex)
*1,1,1-trichloroacetaldehyde
*Benzensulfonyl chloride
*p-chlorobenzenesulfonyl chloride
*p-chlorobenzenesulfonamide
*4,4'-dichlorodiphenylsulfone
*p-acetylaminobenzene sulfonyl chloride
*p-methoxybenzene sulfonyl chloride
*1,2,4,5-tetrachlorobenzene
Amine salts of 2,4-D (dimethyl and triethyl amines)
Amine salts of 2,4,5-T (dimethyl and triethyl amines)
Esters of 2,4-3 (butyl, 2-ethylhexyl, isopropyl, butoxyethoxypropyl)
Esters of 2,4,5-T (butyl, 2-ethylhexyl, isopropyl, butoxyethoxypropyl)
Amine salts of N-oleyl-1,3-propylenediamine
*Nicotine sulfates
Muriatic Acid
*2,5-dichlorophenyl-p-chlorobenzene sulfonate

NOTE: The asterisk denotes raw materials and products not used or made after the explosion in February 1960

TABLE 2.2.1-2

CHEMICALS PRODUCED BY KOLKER CHEMICAL WORKS

Product	Estimated Total Production
2,4-D	85 million pounds
2,4,5-T	25 million pounds
DDT	100 million pounds
HCB	10 million pounds
Ovex	10 million pounds
Lindane	Unknown
Low γ-BHC	<10 million pounds

TABLE 2.2.2-1

MAJOR EVENTS DURING DIAMOND SHAMROCK AND SUBSEQUENT OWNERSHIP

DATE	DESCRIPTION
3/51	Kolker Chemical Works, Inc., acquired by Diamond Alkali Co. Included in the transaction was the 1.8-acre parcel (the northeast portion of the site) on which the herbicides and DDT were being produced.
1/56	Easement obtained to construct a ten-inch sewer under the Central Railroad of New Jersey (now Conrail) tracks. A sewer connecting the plant to the PVSC sewer was subsequently installed. Following construction, most process wastes were diverted from the river to the PVSC treatment plant.
1957-58	Low γ - BHC production transferred to another location.
1958-59	DDT manufacture suspended following construction of a plant in Texas.
2/60	An explosion in the NaTCP unit destroyed the building in which it and several other products were made. Following this explosion, manufacture of all products other than the phenoxy herbicides and their intermediates was discontinued.
4/60	A 1.6-acre parcel (the southwest portion of the site) was leased from the Triplex Oil and Refining Co. (later Walter Ray Holding Co.) to permit expansion of the plant.
Mid 1961	Startup of new units to make NaTCP, DCP, and MCA.
1963	Rehabilitation of the 2,4-D acid process performed. Included was installation of improved ventilation in the area where 2,4-D and 2,4,5-T were made.
7/65	Startup of the melt, washing, and drying process to produce anhydrous, flaked 2,4-D. Capacity increased by 40 percent with this change.

TABLE 2.2.2-1
(Continued)

DATE	DESCRIPTION
10/67	Construction of new 2,4-D unit and conversion of former 2,4-D unit to make 2,4,5-T completed. Both products were now made by the melt, washing, and drying process. Capacity increased by 54 percent for 2,4-D and 67 percent for 2,4,5-T. Purification of TCP also instituted as part of this expansion.
8/69	Production at the plant terminated by Diamond Shamrock.
9/69-12/69	All remaining raw materials and products were sold and removed from the site. Plant equipment was cleaned.
1/70-2/71	No activity. The plant was for sale.
3/16/71	Chemicaland Corp. purchased the 1.8-acre portion of the site and improvements from Diamond Shamrock, which also assigned rights to the lease of the 1.6 acres owned by Walter Ray Holding Co. to Chemicaland.
4/71-8/73	Cloray NJ Corp. (a Chemicaland affiliate) produced benzyl alcohol and some other specialties and performed custom manufacturing in the plant. Operations were suspended in August 1973.
9/73	Chemicaland contracted to make 2,4-D for Diamond Shamrock.
5/74-9/74	Limited quantities of 2,4-D were made during this period but none was delivered to Diamond Shamrock. Operations were suspended and the staff was laid off in September 1974.
2/75	Operations resumed by Chemicaland which was now making 2,4-D for Occidental Chemical Co.
11/22/76	Occidental Chemical assumed control of the management of the plant and continued to manage the plant until February 24, 1977, when control was returned to Chemicaland.
2/24/77	Chemicaland laid off all personnel and shut down the plant as things stood.
3/77-12/79	No information available on activities during this period.

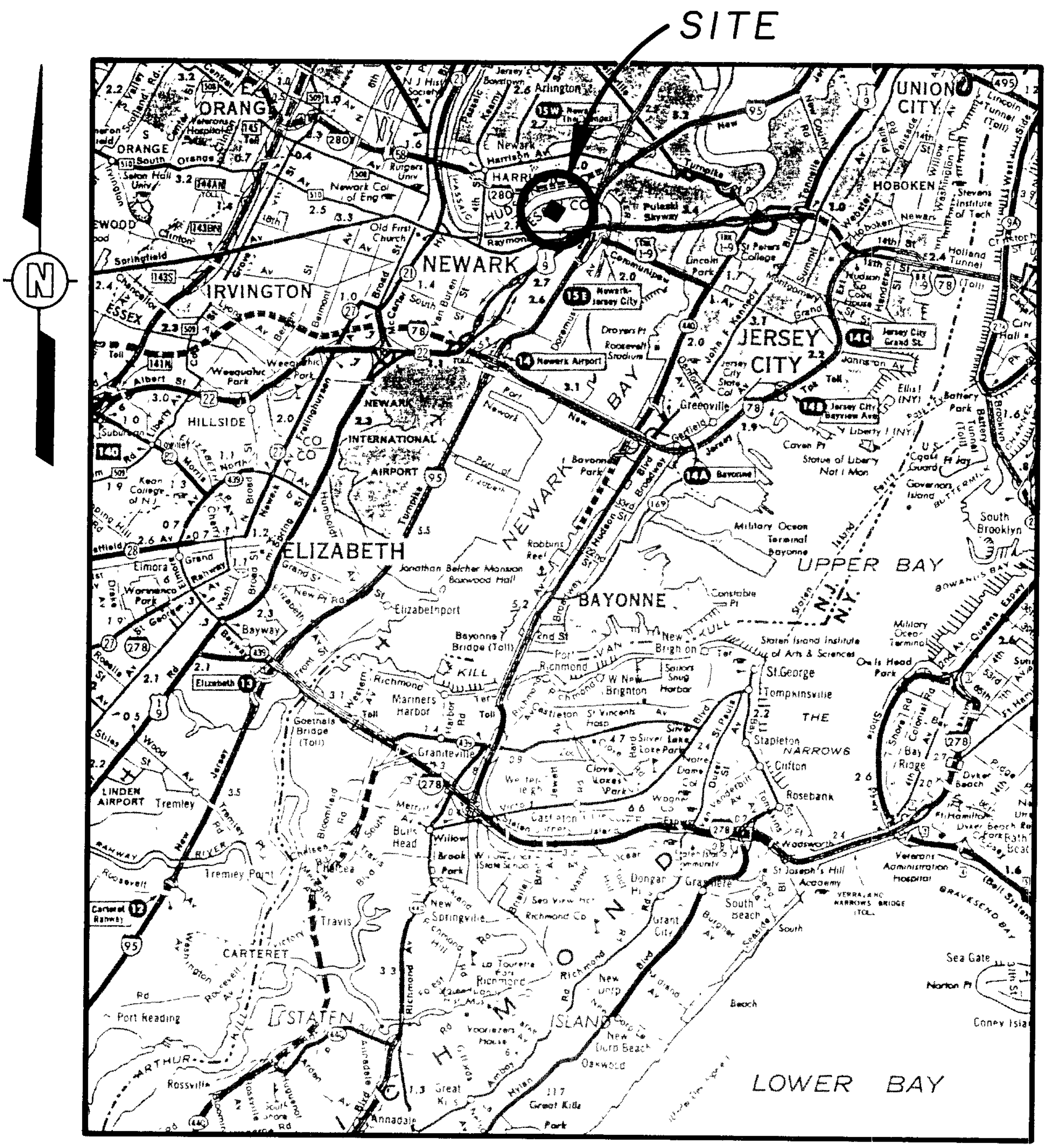
TABLE 2.2.2-1
(Continued)

DATE	DESCRIPTION
1980	The 1.8-acre parcel owned by Chemicaland was acquired by William Leckie (successor to Walter Ray Holding Co.), consolidating ownership of the whole site in his name.
3/81	The entire 3.4-acre site was sold to Marisol, Inc.
1981-82	Plant cleanup and clearing undertaken by Marisol.
1982-83	SCA Corporation leased part of plant and tank farm from Marisol.
5/83	Dioxin was found on the site. Cleanup action initiated by NJDEP and the EPA. Diamond Shamrock secured the site pending evaluation and remediation.

FIGURES

DRAWING NUMBER 84-6248-A4

DRAWN BY	c/b/	4-17-84
CHECKED BY	RZ	4-17-84
APPROVED BY	RK	4-17-84



ROAD CLASSIFICATION:

HEAVY DUTY

MEDIUM DUTY

LIGHT DUTY

UNIMPROVED DIRT

INTERSTATE

STATE ROUTE

U.S. ROUTE

FIGURE 2.1-1

80 LISTER AVENUE SITE LOCATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

"Do Not Scale This Drawing"

DRAWING NUMBER 846248-A5

DRAWN BY J.LOGRECO 6.15.84

CHECKED BY

APPROVED BY

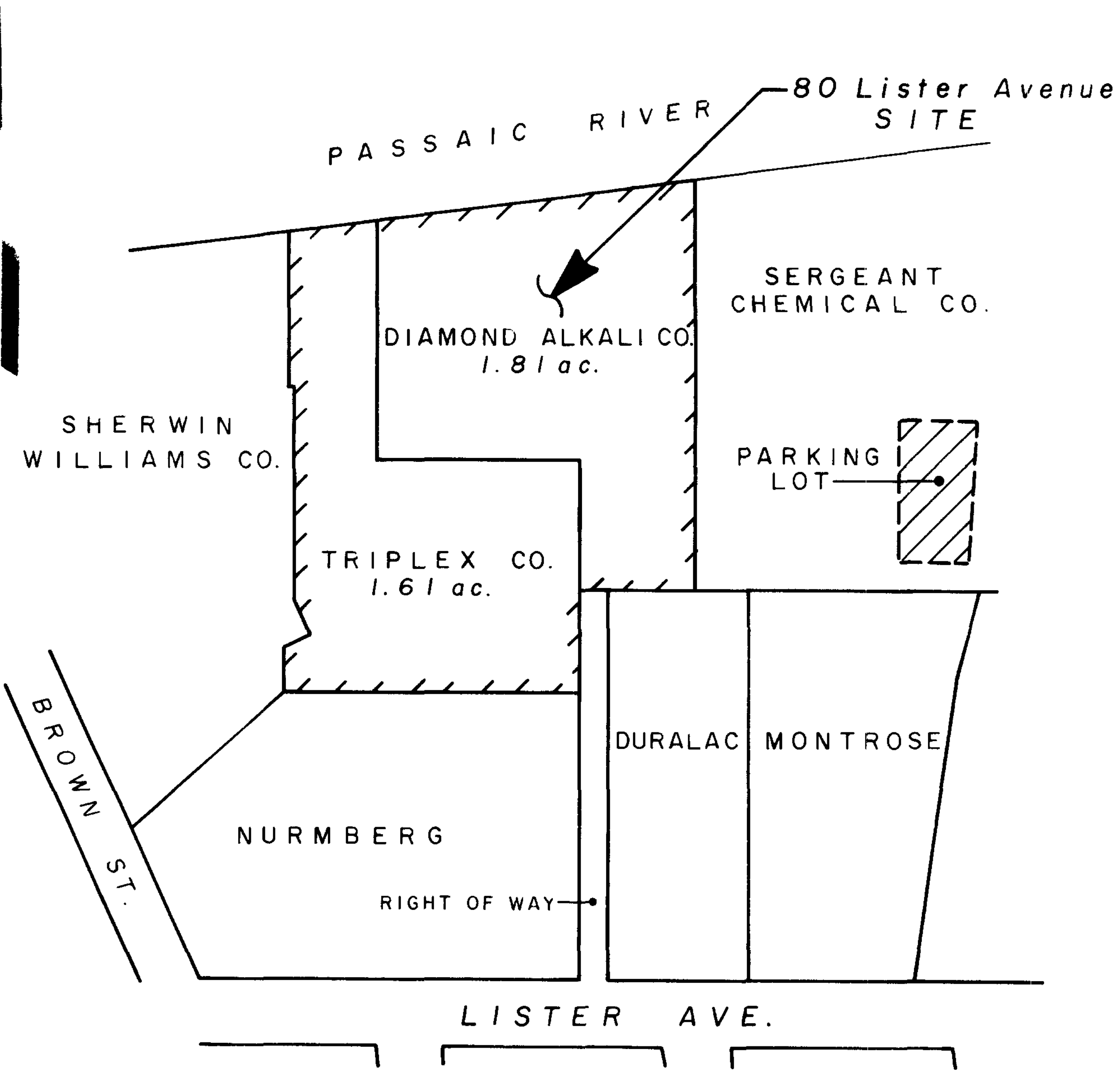


FIGURE 2.1-2

PLOT PLAN FOR 80 LISTER AVE. AND ADJACENT PROPERTIES

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

REFERENCE:
DIAMOND ALKALI COMPANY
DWG. NO. 2NS-583-
TITLED: REAL ESTATE PROPERTY

65360

Do Not Scale This Drawing

IT ... Creating a Safer Tomorrow

DRAWING NUMBER 846248-A18

CHECKED BY

APPROVED BY

DRAWN BY JJL 1-24-85

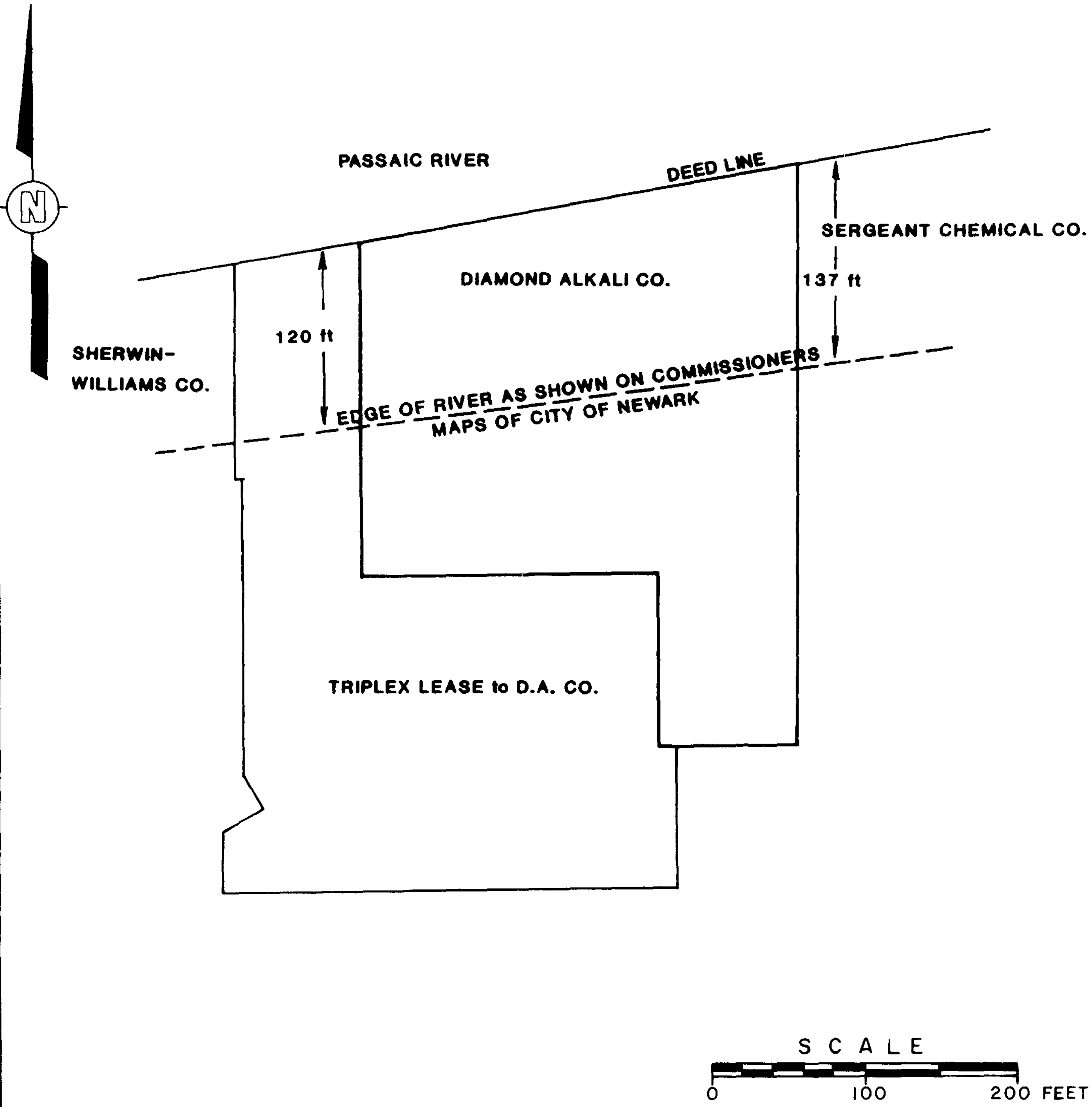


FIGURE 2.2.1-1

PROPERTY LOCATION MAP

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

DRAWING NUMBER 846248-A19

CHECKED BY

APPROVED BY

DRAWN BY JJL 1·24·85

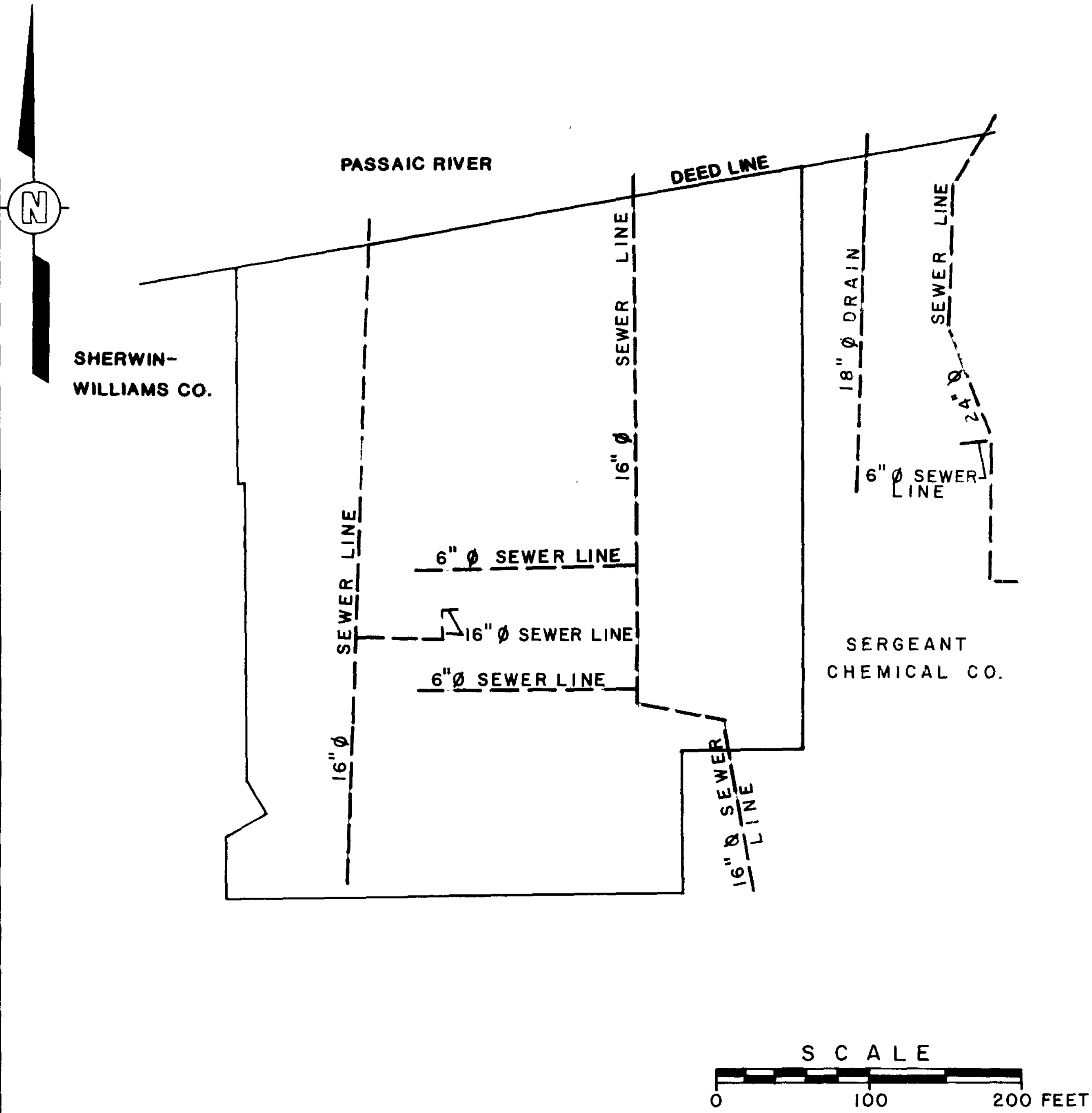


FIGURE 2.2.1-2

LOCATION OF ABANDONED SEWER LINES

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

'Do Not Scale This Drawing'

DRAWING NUMBER 84-6248-A6

CHECKED BY

APPROVED BY

DRAWN BY RW

6-15-84

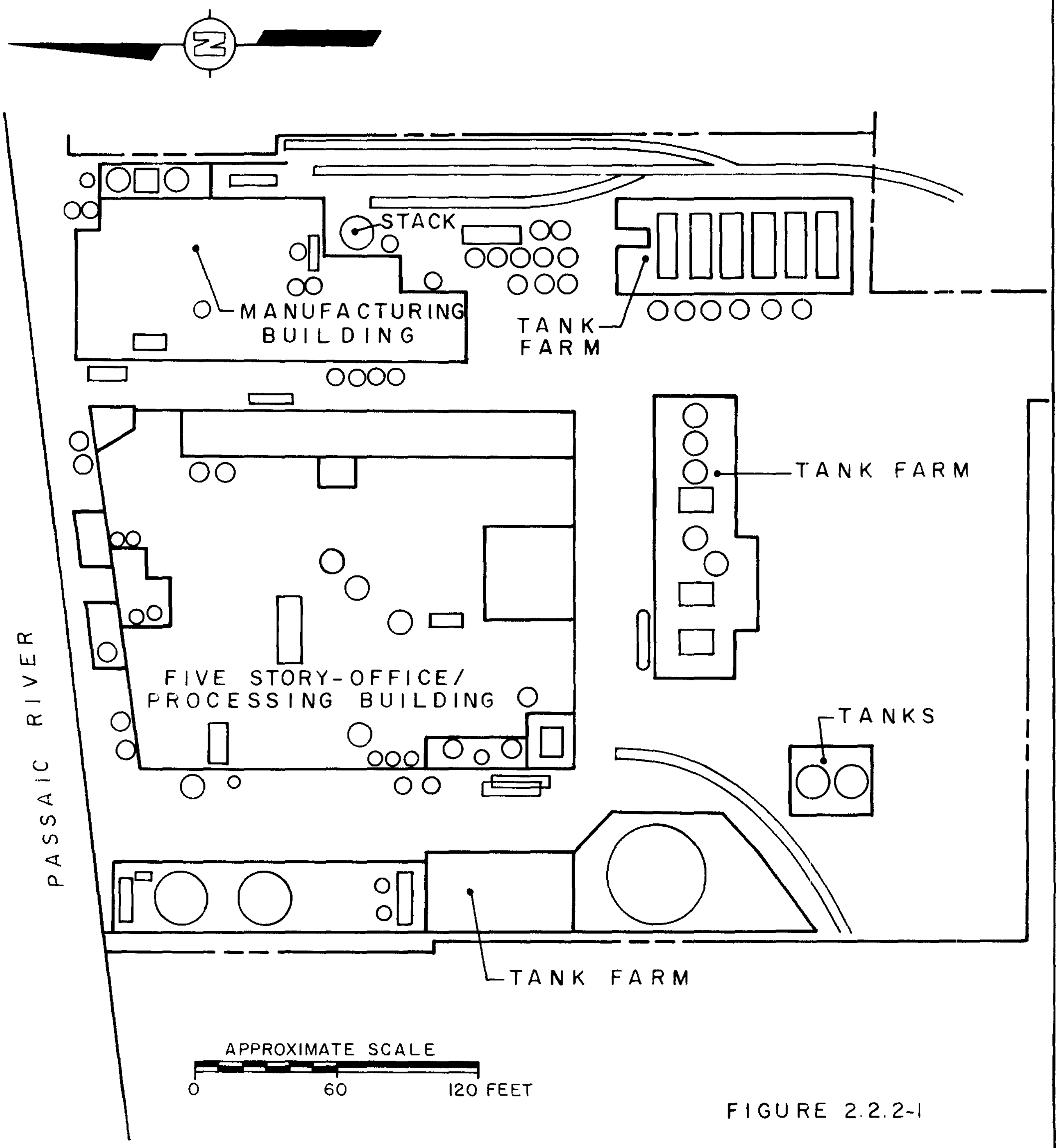


FIGURE 2.2.2-1

FACILITY LAYOUT
PRIOR TO EXPLOSION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT . . . **Creating a Safer Tomorrow**

65360

Do Not Scale This Drawing

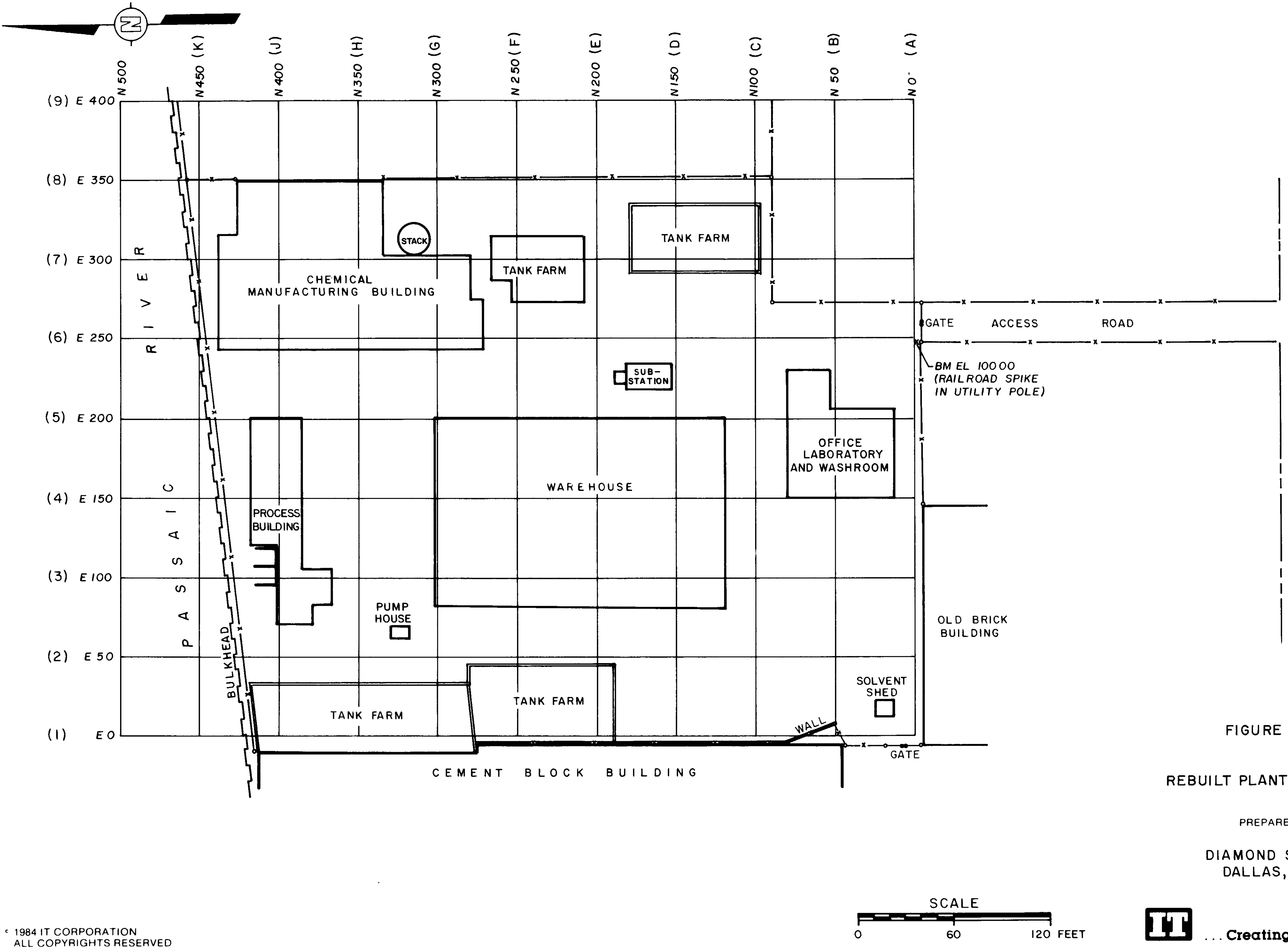


FIGURE 2.2.2-2

REBUILT PLANT CONFIGURATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

DRAWN BY	RW	1-29-85
CHECKED BY	JTO	2-13-85
APPROVED BY	DGE	2-13-85
DRAWING NUMBER	846248-B19	

65360

Do Not Scale This Drawing

3.0

3.0 REGIONAL SETTING

3.1 CLIMATE AND METEOROLOGY

3.1.1 General

Climate and meterological conditions at the site have been characterized from 40 years of weather records available from the National Weather Service at Newark International Airport. The airport is located approximately three miles southwest of the site in a similar physiographic setting. The climatic data at the airport are, therefore, considered representative of conditions at the site.

The climate of the site is humid and is typified by moist, warm summers and moderately cold winters with winds of moderate velocity. The land around the site which was originally flat and marshy is now almost fully developed by industry and associated infrastructure.

3.1.2 Wind

Prevailing winds in the site area are from the southwest with only small seasonal variations in direction. Mean wind speeds are generally highest during the winter and spring months (10 to 12 miles per hour), while the lowest values (8 to 9 miles per hour) occur during the summer season. The predominant wind direction for winter months is west-northwest (13 percent of the time) while southwest (42 percent of the time) winds predominate during the summer. The highest wind speed recorded in the area was 82 miles per hour from the east in November 1950. During the 50-year period ending in 1965, 23 tornadoes were recorded in New Jersey resulting in two deaths and damage in the range of $2.5 million (Dunlap, 1967).

The winds of the Newark area are greatly affected by two factors--the Atlantic Ocean and the topography of the surrounding area. To the northwest are ridges oriented roughly in a south-southwest to north-northeast direction. These ridges rise to an elevation of about 200 feet at a distance of 4.5 to 5 miles and to 500 to 600 feet at a distance of 7 or 8 miles. All winds between the west-northwest and north-northwest directions are down slope from these ridges and, as a result, are subject to an adiabatic temperature increase. This effect is evident in the rapid improvement in the weather which normally occurs with a shift in the wind to the westerly direction following a coastal storm or passage of a front. The drying effect of these westerly winds accounts for the low number of local thunderstorms. The Atlantic Ocean influences weather conditions in the area of the site when winds are easterly, particularly southeasterly (NOAA, 1983).

A summary of seasonal and annual occurrence of wind direction is presented in Table 3.1.2-1 and is shown in Figure 3.1.2-1. Monthly average wind speed and prevailing wind direction are presented in Table 3.1.2-2 and average wind speeds for each wind direction are shown in Figure 3.1.2-2.

3.1.3 Temperature

The average annual temperature at Newark International Airport between 1944 and 1983 was 53.9°F. Temperature variations of 5 to 15 degrees, depending upon the season, are not uncommon when the wind changes from southeasterly to southwesterly. In the summer, there are long periods of time when the weather remains very hot, especially when the wind is from the west southwest and a Bermuda high pressure system is established. Cold temperatures in the winter are experienced when continental polar winds are blowing from the northwest. Table 3.1.3-1 summarizes the average monthly and annual temperature.

3.1.4 Precipitation

The average annual precipitation for the area is 41.45 inches, based on data from 1944 to 1983. Precipitation falls fairly uniformly throughout the year, although the region is influenced by seasonal tropical storms and hurricanes. Monthly precipitation averages range from 2.82 inches

(October) to 4.27 inches (August). Table 3.1.4-1 provides average precipitation data for Newark, including monthly and 24-hour maximums.

Precipitation patterns at the site are influenced by wind direction. Winds from either the north or the south bring most of the precipitation that falls in the area. Northerly winds consist of continental polar winds from Canada which collect moisture over the Great Lakes. This moisture is carried to northern New Jersey where it is deposited as rain or snow. When the wind is from the south, the warm, moist coastal winds bring moisture into the area.

3.1.5 Evaporation

Evaporation studies done in the area between 1956 and 1970 show that the average annual pan evaporation for Newark is 49.69 inches. Pan evaporation in Newark is highest in the month of July at 6.99 inches and lowest in the month of December at 1.64 inches. These evaporation values represent estimates occurring from a Class A pan (Farnsworth and Thompson, 1982).

Free water surface evaporation is the amount of water evaporated from a shallow lake, wet soil, or other moist natural surface. It is roughly 70 percent of the evaporation from a Class A pan for the same meteorological conditions. The annual free water surface evaporation for Newark is calculated to be approximately 35 inches.

3.2 GEOLOGY AND LANDFORMS

3.2.1 Physiography

The site is situated in the Piedmont Lowland section of the Piedmont Physiographic Province. This province is located between the Atlantic Coastal Plain and the Valley and Ridge Province (Figure 3.2.1-1).

In New Jersey, the Piedmont Lowland section is underlain by igneous and sedimentary rocks of Triassic-Jurassic Age. The igneous rocks in the section are generally more resistant and form hills and ridges while the sedimentary rocks occur in the low areas. The section is characterized by rounded ridges separated by wide valleys and isolated hills which rise abruptly above the surrounding landscape. The general surface of the section slopes from around Elevation 400 feet (MSL) in the northwest to sea level at Newark Bay.

As an industrial area that has been occupied for over 100 years, the entire site has been built up with fill. Approximately 6 to 8 feet of cinders, bricks, sand, and rubble have been placed over natural materials. In this process, the site has been intentionally leveled. Total relief across the site is approximately 3 feet with the lowest point along the railroad tracks at the southern boundary. Elevations vary between approximately 7 and 10 feet (MSL). Much of the site has been capped with either pavement or gravel and it is currently covered with a geofabric.

3.2.2 Regional Structural Geology

The bedrock of the Piedmont Lowland consists of igneous and sedimentary rocks of Triassic-Jurassic Age, known as the Newark Supergroup (Olsen, 1980). These rocks accumulated in the Newark Basin, a fault-controlled structural basin believed to be one of the numerous parallel and subparallel basins which formed as a result of the rifting apart of the continental plates at the time of the formation of the Atlantic Ocean Basin. Uplifting that resulted from later collision of the continental plates created the parallel ridges separating the Newark Basin from the Atlantic Ocean Basin. Subsequent intrusion of basaltic lava formed dikes and sills through the sedimentary profile.

Sediments accumulated in the Newark basin on an unconformity on Paleozoic and Precambrian basement rock (Figure 3.2.2-1). Basic igneous rocks were intruded into the sediments (Palisades sill, diabase dikes) and extruded onto the sediments (Watchung basalt flows) during the period of deposition.

The Newark Basin is bounded on the northwest by the Ramapo Border Fault. This fault is a normal fault which separates the Precambrian rocks of the highlands from the Triassic-Jurassic rocks of the lowlands. During the period of deposition and active tectonics, downdropping of the basin continued along the fault. As a result, the rocks in the basin generally dip 5 to 25 degrees to the northwest. The oldest exposed formations are seen along the eastern edge of the basin and the youngest rocks are seen along the western edge at the fault. The total stratigraphic thickness of rock units deposited in the Newark Basin is calculated to be in excess of 30,000 feet.

The bedrock underlying the site is the Passaic Formation (Olsen, 1980), which is more commonly known as the pre-basalt portion of the Brunswick Formation (Kummel, 1940). This formation consists chiefly of soft red shale and sandstone.

Approximately 15,000 years ago, the area around the site was probably part of a delta (Figure 3.2.2-2) before being submerged beneath Lake Hackensack (Figure 3.2.2-3). The lake was fed by a retreating ice sheet to the north, dammed by a terminal moraine on the south, and confined between two erosional remnant ridges. About 10,000 years ago, the terminal moraine damming the lake was breached, resulting in the drainage of the entire body of water. The lake bed left behind developed into a flatland forest and a meadow now called the Hackensack Meadows.

The Hackensack Meadows lies between the First Watchung Mountain and the Palisades Ridge (Lovegreen, 1974) (Figure 3.2.2-1), and is a physiographic feature formed by sediment deposition in the bottom of the extinct glacial Lake Hackensack. The sediments consist of deposits of till, some varied clays, glacio-fluvial sands and gravels, and glacio-lacustrine deltas (Salisbury, 1902; Lovegreen, 1974; Averill et al., 1980; Agron, 1980). Since the last glaciation, sea level has risen such that today Hackensack Meadows is a tidal marsh. The marsh is drained by the Passaic River Estuary and the Hackensack River Estuary, and empties into Newark Bay.

The site is located in the southwestern portion of the Hackensack Meadows and is underlain primarily by silts, sands and gravel deposited by glacial meltwater. Figure 3.2.2-4 shows the site in relation to the approximate boundary of the Hackensack Meadows. Figure 3.2.2-5 shows a cross section of the Hackensack Meadows in the vicinity of the site.

3.3 HYDROLOGY

3.3.1 Surface Water

The site is located in the Lower Valley portion of the Passaic River drainage basin. The Lower Valley is the southeasterly portion of the basin lying between the Central Basin and the mouth of Newark Bay (Figure 3.3.1-1). It is characterized as a flat relatively narrow floodplain of 1,000 to 2,000 feet in width, abutting low rolling hills. From Dundee Dam to the mouth of Newark Bay, the river is a tidal estuary and is navigable. The site is approximately three miles upstream from the mouth of Newark Bay.

The closest known surface water gaging station on the Passaic River is at Little Falls, New Jersey, which is about twenty-six river miles upstream from the site. The gaging station is also upstream from the Dundee Dam, and therefore, river elevations at this station are much higher than river elevations at the site, and thus are not representative of site conditions. Tidal elevations for the Passaic River at Newark are reported by the National Oceanic and Atmospheric Administration (NOAA, 1972). The mean tidal range (difference in height between mean high water and mean lower water) is reported by NOAA as 5.1 feet. The spring range (average semidiurnal range occurring semimonthly as a result of the moon being New or Full) is reported by NOAA as 6.1 feet with the mean tide level (midway between mean low water and mean high water) at 2.5 feet.

The United States Geologic Survey (USGS) has developed equations using standard regression techniques for estimating mean annual flow of New Jersey streams. Because the Passaic River lies above the Fall Line (line of transition from the Atlantic Coastal Plain to the Piedmont Plateau), the USGS considers the river to be a noncoastal drainage basin. Flow in noncoastal drainages can be expressed as (USGS, 1984):

mean annual flow (cfs) = 1.534 A
where A = drainage area in square miles
cfs = cubic feet per second

Table 3.3.1-1 shows the mean annual flows for the Passaic River at the Little Falls gaging station and for the gaged tributary streams below Little Falls. The total drainage area of the Passaic River Basin is approximately 900 square miles which means that 55.5 square miles are not gaged in the lower basin. Using the USGS equation for noncoastal drainages, mean annual flow from the 55.5 square miles is calculated to be 85 cfs. Adding this flow to the total in Table 3.3.1-1 yields a mean annual flow at the mouth of the Passaic River of 1,392 cfs, or approximately 1,400 cfs.

The seven-day ten-year discharge (7-10) is the low flow that may be expected to occur on seven consecutive days on the average of once every ten years. A 7-10 value was estimated for the Passaic River at the project site from the Little Falls, New Jersey gaging station data and extrapolated by considering the additional drainage area between Little Falls and the site. Assuming the total drainage area is approximately 900 square miles, the 7-10 value has been estimated to be 60 cfs.

Passaic River Flooding

The Passaic River basin lies in the tracks of most east coast storms and is consequently subject to occasional rainfalls of great intensity. The types of storms producing damaging floods on the Passaic include late summer storms originating over the ocean to the south (such as 1881, 1903, 1945); fall or hurricane storms (such as 1810, 1919, 1938, and 1955); spring storms originating over the continent to the west and southwest (such as 1896, 1901, 1936, 1951, and 1968); and local thunderstorms (such as 1819, 1843, 1865). Of these storms, the greatest flood of record was due to the storm of 1903 which, in the reach from Dundee Dam to the Newark Bay, inundated an area of 1,520 acres to a maximum depth of 14.5 feet. The most recent severe floods occurred in 1936, 1945, 1955, and 1968 (COE, 1968).

Unlike upstream areas where flooding is controlled by rainfall events, flooding of the Passaic River at the site is controlled mainly by tidal influences. The greatest potential for inundation in the Lower Valley comes from the storm surge and tidal flooding associated with a major storm. The cross-sectional area of the channel in the tidal zone of the river is so great in relation to the discharge that any rise in water level as a result of rainfall is minimal when compared to elevation changes due to tides. According to the U.S. Army Corps of Engineers flood insurance study for the region, flood elevations for the 10-, 50-, 100-, and 500-year tides are 7.5, 9.3, 10.2, and 12.8 feet above MSL, respectively (COE, 1968). Partial inundation of the site from the Passaic River was reported in 1983.

Flooding occurs in the Lower Valley (and at the site) due to a relatively narrow flood channel that is constricted by many bridges, heavy urban development along the river banks, and generally flat slopes that are constrained by rock outcrops. The natural storage in the Central Basin reduces the contributing flood flows into the Lower Valley from the flash-flood susceptible highland tributaries (the Ramapo, Wanaque, Pequannock, Rockaway, and Whippany Rivers).

Passaic River Dredging

A number of changes have been made to the river channel since the flood of 1903 that limit the severity of flooding that could occur from a similar storm. These factors include bulkheading and filling of the channel, dredging of the channel, and construction of dams on the river.

The Passaic River channel and the shipping channels in Newark Bay and the nearby Hackensack River are active commercial channels that are regularly maintained. The channels are dredged to permit navigation by barge and boat traffic. The dredging program is performed by the U.S. Army Corps of Engineers (COE). The COE (1975) has divided the navigable portion of the Passaic River into four separate sections of different project depths: the 10-foot, 16-foot, 20-foot, and 30-foot Projects (Figure 3.3.1-2).

The downstream limit of the 10-foot Project (channel dredged to a 10-foot depth) is approximately 8 miles upstream from the mouth of the Passaic. The 16-foot Project ends approximately 7 miles upstream from the mouth. The 20-foot Project extends to just downstream from the New Jersey Turnpike Bridge. The 30-foot Project includes the rest of the Passaic River to the confluence of the Passaic and Hackensack rivers.

The site is located on that section of the river designated as the 20-foot Project. In 1937 the Passaic River channel was dredged to a depth of 20 feet from the downstream limit of the 20-foot Project to the Jackson Street Bridge (Figure 3.3.1-2). Earlier, between 1921 and 1923, various portions of this segment of the channel were dredged to the project depth of 20 feet. Since 1937, however, no portion of the 20-foot Project downstream from the Jackson Street Bridge has been dredged (COE, 1984).

Because commercial traffic on the Passaic River above the 30-foot Project is declining, the COE has indicated that there may not be any reason to maintain the 20-foot Project to full depth. However, the possibility exists that the channel could be dredged to an intermediate depth to maintain the channel for barge traffic. Before any dredging could be performed, public notice would have to be given by the COE.

The 30-foot Project of the Passaic River is immediately downstream from the 20-foot Project and has been established for container ships in Port Newark. The dredging history for the 30-foot Project since 1956 is shown in Figure 3.3.1-3. Identified are the portions of the 30-foot Project that were dredged to a 30-foot depth in 1956, 1961, 1964, 1971, 1977, and 1983. Figure 3.3.1-3 also shows the amounts of material that were dredged from the 30-foot Project during the dredging years since 1956. The dredged spoil was normally disposed of in the Atlantic Ocean somewhere off the New Jersey coast (COE, 1984).

The sedimentation rate in the Passaic River is probably influenced by tidal fluctuations. The sedimentation rate provides a measure of the length of time it takes for contaminants to become buried in the river sediments and unavailable for transport. The COE was contacted regarding rate of sedimentation on the Passaic River in the vicinity of the site and it was determined that these data do not exist.

The COE points out that, even though the 20-foot Project has not been dredged since 1937, barge traffic is still using the channel without difficulty. At the writing of this report, data from a hydrographic survey were not available to determine channel depth. When these data become available, it will be possible to make an approximate estimate of the annual rate of deposition of sediment in the vicinity of the site.

3.3.2 Ground Water

The source of ground water recharge at the site is precipitation that does not run off the land surface to streams or return to the atmosphere through evapotranspiration. This precipitation infiltrates the ground and moves through and is stored in geologic formations. Geologic formations which can yield economically significant quantities of water to wells or springs are called aquifers. The regional aquifers in the vicinity of the site are the bedrock of the Brunswick Formation of Triassic age and the unconsolidated glacio-fluvial sands and gravel deposits of Pleistocene age.

The principal source of ground water in the area is the rocks of the Brunswick Formation. The shales and sandstones are generally capable of sustaining moderate to large yields to wells, but the Orange Mountain Basalt is capable of only small to moderate yields. The unconsolidated Pleistocene sand and gravel deposits, although capable of sustaining large yields, are of somewhat limited extent in the vicinity of the site.

Water in the rocks of the Brunswick Formation occurs under both unconfined and confined conditions. In the upland areas, the aquifer is generally unconfined. In the lowlands of the Hackensack Meadows, the aquifer is generally confined or semiconfined by glacio-lacustrine clay. Where the aquifer is confined by relatively impermeable layers, it is commonly under artesian pressure. The area around Newark has been subjected to heavy pumping, however, and the artesian pressure has been reduced. In part of Newark, extensive pumping has actually dewatered parts of the aquifer such that it no longer behaves as a confined aquifer (Nichols, 1968).

The ground water moves in the bedrock both vertically and horizontally from zones of secondary porosity through systems of interconnected joints and fractures. Most wells that are screened in this interval draw from more than one water-bearing zone, but the boundaries of the zones have not yet been accurately defined. Some wells penetrate from 400 to 600 feet below ground surface to reach these zones. The best producing wells, however are 300 to 400 feet deep (Nichols, 1968).

The bedrock aquifer in the site area has been found to be anisotropic (i.e., it does not transmit water equally in all directions). Water moves more readily along joints and fractures which strike parallel to the strike of the bedding than along joints and fractures that strike in other directions. The strike of bedding in the site area is generally N 30° E.

The glacio-fluvial sands and gravels constitute an aquifer of limited extent. In the site area, these materials occur as valley fill deposits occupying buried bedrock valleys. The sands and gravels are generally interlayered with till and clays which reduce their total permeability. However, where layers of coarse sand and gravel are encountered, wells yielding 175 to 600 gallons per minute (gpm) have been developed (Herpers and Barksdale, 1951). Unfortunately, pumping from this aquifer has also been in excess of fresh water recharge and, as a result, salt water intrusion is occurring.

Ground water yields from the Brunswick Formation range from 35 to 820 gpm for the shales and sandstones and from 7 to 400 gpm for the Orange Mountain Basalt. Specific capacities of the wells in the shales and sandstones ranged from 0.2 to 70 gpm per foot of drawdown (averaging 11.1 gpm per foot of drawdown). Specific capacities of wells in the basalt range from 0.05 to 5.66 gpm per foot of drawdown (averaging 1.74 gpm per foot of drawdown) (Nichols, 1968).

Although the water quality of the bedrock aquifer is generally considered to be good, salt water intrusion in the vicinity of the site has occurred as a result of the heavy pumping in this industrialized area. In 1879, analysis of a ground water sample from this vicinity showed 6.2 ppm chloride. In 1948, a ground water sample showed 1900 ppm chloride.

The heavy pumping has greatly lowered water levels in the area over the last 100 years. In eastern Newark adjacent to Newark Bay and the

Passaic River, the water levels by the year 1900 had been pumped to 40 to 130 feet below ground surface. Continued pumping in the 1900's has lowered the water level even further. This can be seen by comparing the contours in Figures 3.3.2-1 and 3.3.2-2. In 1879, evaluation of wells in the vicinity showed ground water levels from a few feet above to 25 feet below the ground surface. The heavy pumping has reversed the natural gradients in this vicinity and the dredging of the shipping channels in Newark Bay and the Passaic River has exacerbated the salt water intrusion problem by removing part of the barrier between the ground and surface waters (Nichols, 1968).

Ground water wells within a one-mile radius of the site were identified through permit records on file with the NJDEP. Table 3.3.2-1 presents the identified wells and their locations along with the relevant information obtained from the well permits.

3.4 FLORA AND FAUNA

The land in the vicinity of the site consists of tidal marsh and built-up land which is classified primarily as urban industrial. The terrestrial ecology of the natural environment is restricted to the tidal marsh, which has been modified by its proximity to the urban industrialized area. The industrialized area consists of a considerable number of buildings and an extensive amount of paved surface with very little exposed ground available to support flora or fauna.

Vegetation in the tidal marsh is primarily Phragmites australis (common reed), plus other wetland species such as Typha augustifolia (cattail) and Scirpus americana (bulrush). The terrestrial animals expected to be found in the immediate vicinity are likely to include various ground-feeding birds, eastern cottontail rabbits, and other small mammals such as the meadow vole. In the open marsh, muskrats are common and herptiles such as the garter snake and American toad are also present.

The area of the site itself is industrialized with only the slightest traces of natural flora and fauna commonly found in a highly developed urban environment. No unique or endangered species or habitats are known to occur at the site or in the surrounding vicinity.

Information obtained from the New Jersey Department of Health and the NJDEP/Office of Science and Research indicates that fishing in the Passaic River in the vicinity of the site has been prohibited. A prohibition on sale and consumption of all fish and shellfish from the area between Dundee Dam and Newark Bay has been in effect since 1983. In addition, signs prohibiting fishing have been posted on the Passaic River. It should be noted, however, that no signs were observed during the period of on-site activities. It is reported that recreational crabbing occurs periodically in the vicinity of the site.

In 1982, an advisory was issued limiting consumption of selected fishes from Newark Bay. These fishes included the American eel, white catfish, white perch, striped bass, and the blue crab. No prohibition on sale and consumption of these fish and shellfish has been issued to date.

No known commercial fishing is presently being conducted in Newark Bay, but periodically, during certain seasons of the year, considerable recreational crabbing reportedly occurs.

3.5 LAND USAGES

The portion of Newark where the site is located has been used by heavy industry for over 100 years. The Newark Master Plan (1978) designates the area in which the site is located as "heavy industry." On the Master Plan, the site is located in Plan Area 5, designated "Newark Airport - Port Newark" (Figure 3.5-1). The industrial land use objectives of the Newark Master Plan are identified as follows:

- Encourage the reuse and recycling of sound industrial facilities.

- Provide adequate supplies of industrial land uses which, in turn, will generate a broad range of job opportunities within the community.
- Concentrate heavy industrial land use in the Meadowlands area; light industrial uses in both the Ironbound and the Triangle area (the area generally defined by Mulberry Street, Market Street, and McCarter Highway).
- Allow for the controlled expansion of industrial development within areas where growth is now restricted due to incompatible abutting land uses.

The closest land area zoned for residential use in Newark is approximately one-quarter mile from the site.

3.0 REFERENCES

Agron, S. L., 1980, "Environmental Geology of the Hackensack Meadowlands," Field Studies of New Jersey Geology and Guide to Field Trips, W. Manspiezer ed., Rutgers University, Newark, New Jersey.

Averill, S. P., R. R. Pardi, W. S. Newman, and R. J. Dineen, 1980, "Late Wisconsin - Holocene History of the Lower Hudson Region: New Evidence from he Hackensack and Hudson River Valleys," Field Studies of New Jersey Geology and Guide to Field Trips, W. Manspiezer ed., Rutgers University, Newark, New Jersey.

Carswell, L. D., 1976, "Appraisal of Water Resources in the Hackensack River Basin, New Jersey," USGS Water-Resources Investigations 76-74, U.S. Geologial Survey, Trenton, New Jersey.

COE, 1968, "Passaic River Basin Water Resources Development," U.S. Army Engineer District, New York, and Department of Conservation and Economics Development, State of New Jersey, Trenton, New Jersey.

COE, 1975, Map of Newark Bay, Hackensack and Passaic Rivers, New Jersey, from Federal Project No. 64., U.S. Army Corps of Engineers, New York District, New York, New York.

COE, 1984, Personal communication from Soon Lew, Civil Engineer, Navigation Branch, U.S. Army Corps of Engineers, New York District, New York, New York to Woodward-Clyde Consultants, Wayne, New Jersey.

Dunlap, D. V., 1967, "The Climate of New Jersey," Climate of the States--A Practical Reference Climatological Data of the United States, Vol. 1, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C.

Farnsworth, R. K. and E. S. Thompson, 1982, "Mean, Monthly, Seasonal and Annual Pan Evaporation for the U.S.," NOAA Technical Report, NWS 34, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C.

Herpers, H. and H. C. Barksdale, 1951, "Preliminary Report on the Geology and Ground Water Supply of the Newark, New Jersey Area," Special Report 10, State of New Jersey Department of Conservation and Economic Development, Trenton, New Jersey.

Kummel, H. B., 1940, "The Geology of New Jersey," Bulletin 50, Department of Conservation and Development, Trenton, New Jersey.

Lovegreen, J. R., 1974, "Paleodrainage History of the Hudson Estuary," Masters Thesis, Department of Geology, Columbia University, New York, New York, 152 p.

Newark Master Plan, 1978, City of Newark, New Jersey.

Nichols, W. D., 1968, "Ground Water Resources of Essex County, New Jersey," Special Report No. 28, State of New Jersey Department of Conservation and Economic Development, Trenton, New Jersey.

NOAA, 1972, "Tide Tables, High and Low Water Prediction," 1973, East Coast of North America and South America Including Greenland, U.S. Department of Commerce, National Ocean Survey, Rockville, Maryland.

NOAA, 1978, "Airport Climatological Summary, Newark, New Jersey International Airport," Climatography of the U.S. No. 90 (1965-1974). National Climatic Data Center, Asheville, North Carolina.

NOAA, 1983, "Local Climatological Data; Annual Summary with Comparative Data 1983, Newark, New Jersey," National Climatic Data Center, Asheville, North Carolina

Olsen, P. F., 1980, "Triassic and Jurassic Formations of Newark Basin," Field Studies of New Jersey Geology and Guide to Field Trips, W. Manspiezer ed., Rutgers University, Newark, New Jersey.

Salisbury, R. D., 1902, "The Glacial Geology of New Jersey." Geological Survey of New Jersey, Trenton, New Jersey.

Schuberth, C. J., 1968, The Geology of New York City and Environs, The Natural History Press, Garden City, New York.

USGS, 1984, Personal communication from Robert Shopp, Hydrologist, U.S. Geological Survey, Trenton, New Jersey to Woodward-Clyde Consultants, Overland Park, Kansas.

Vermeule, C. C., 1896, "Map of Hackensack Meadows to Illustrate Report on Drainage," Geological Survey of New Jersey, Trenton, New Jersey.

WCC, 1982, "Draft Environmental Impact Assessment for Port Authority/ Essex County Resource Recovery Facility," Prepared for Port Authority New York/New Jersey and Essex County by Woodward-Clyde Consultants, Wayne, New Jersey, October 4, 1982.

Wolfe, P. E., 1977, The Geology and Landscapes of New Jersey, The Crane Russak Company, New York, New York.

TABLES

TABLE 3.1.2-1

SEASONAL AND ANNUAL OCCURRENCE OF WIND DIRECTION

WIND DIRECTION	OCCURRENCE (Percentage of Time)				
	SUMMER	AUTUMN	WINTER	SPRING	ANNUAL
N	3.3	3.7	4	4.3	3.8
NNE	7	10	8	7	8.0
NE	5.7	6.3	6.7	6.7	6.4
ENE	3.7	3.7	3.3	5.7	4.1
E	3.7	3	3	5.3	3.8
ESE	4	3.7	2	6	3.9
SE	3.7	2.7	1	3	2.6
SSE	6.7	4	2	4.3	4.3
S	5.7	4	2.7	3.7	4.0
SSW	11.7	10	7	7	8.9
SW	12	11.7	9.7	8	10.4
WSW	8	8	9.3	7.7	8.3
W	5.7	7	7.7	5.7	6.5
WNW	6.7	7.3	13	9	9.0
NW	5.7	6.7	11	8.3	7.9
NNW	5	6.3	9.3	7.7	7.1
	98.3	98.1	99.7	99.4	99.0

Reference: WCC, 1982

TABLE 3.1.2-2

MONTHLY AVERAGE WIND SPEED AND PREVAILING WIND DIRECTION(1)

MONTH	MEAN WIND SPEED(2) (mph)	PREVAILING WIND DIRECTION(3)
January	11.2	NE
February	11.5	NW
March	12.0	NW
April	11.3	WNW
May	10.0	SW
June	9.3	SW
July	8.8	SW
August	8.6	SW
September	8.9	SW
October	9.3	SW
November	10.1	SW
December	10.8	SW
Annual	10.1	SW

(1)Recorded at Newark Airport.

(2)Length of record 35 years.

(3)Length of record 22 years.

Reference: WCC, 1982

TABLE 3.1.3-1

AVERAGE MEAN, MAXIMUM, AND MINIMUM TEMPERATURE
NEWARK, NEW JERSEY

(Data Period 1944 - 1983)

	MEAN (°F)	MAXIMUM (°F)	MINIMUM (°F)
January	31.4	38.5	24.3
February	32.5	40.1	24.8
March	40.9	49.0	32.7
April	51.4	60.7	42.0
May	62.1	71.7	52.4
June	71.2	80.6	61.8
July	76.5	85.6	67.3
August	74.8	83.7	65.9
September	67.7	76.7	58.6
October	56.8	66.0	47.5
November	46.1	53.9	38.2
December	35.1	42.2	28.0
Annual	53.9	62.4	45.3

Reference: NOAA, 1983

TABLE 3.1.4-1

PRECIPITATION DATA
NEWARK, NEW JERSEY

(Data Period- 1944 to 1983)

PRECIPITATION IN INCHES (Water Equivalent)

MONTH	NORMAL	MAXIMUM MONTHLY	YEAR	MAXIMUM IN 24 HRS.	YEAR
January	2.91	5.12	1964	1.78	1962
February	2.95	4.47	1956	2.45	1961
March	3.93	6.29	1954	2.58	1969
April	3.44	6.42	1958	2.01	1958
May	3.60	6.28	1968	4.11	1968
June	2.99	6.40	1975	2.31	1973
July	4.03	8.02	1975	3.40	1971
August	4.27	11.84	1955	7.84	1971
September	3.44	9.00	1975	5.27	1971
October	2.82	6.70	1955	3.04	1973
November	3.61	8.42	1972	3.78	1972
December	3.46	7.24	1973	2.14	1973
Year	41.45	11.84	Aug. 1955	7.84	Aug. 1971

Reference: NOAA, 1983

TABLE 3.3.1-1

DRAINAGE AREAS AND MEAN ANNUAL FLOWS IN THE PASSAIC RIVER BASIN

STREAM AND STATION	DRAINAGE AREA (sq. mi.)	MEAN ANNUAL(1) FLOW (cfs)
Passaic River at Little Falls	762	1,166
Saddle River at Lodi	54.6	98
Weasel Brook at Clifton	4.5	6
Third River at Passaic	11.8	22
Second River at Belleville	11.6	18
TOTAL	844.5	1,307

(1) 1980 U.S. Geological Survey Data

Reference: USGS, 1984

TABLE 3.3.2-1

PERMITTED WELLS WITHIN ONE MILE OF 80 LISTER AVENUE

REPORTED ADDRESS	OWNER	DATE DRILLED	TOTAL DEPTH BELOW SURFACE ELEVATION (ft)	YIELD (gpm)	DIAMETER (in)	DEPTH BELOW SURFACE ELEVATION TO BEDROCK (ft)	USE	FORMATION(1)
Freeman Street Newark	P. Ballentine & Sons	1937	875	375	16	95±	Industrial	TR_b
Lister Avenue	Kolker Chemical Works	12/11/51	802	600	12	127±	Industrial	TR_b
Lister Avenue	Kolker Chemical Works	4/27/49	359	300	10	98±	Industrial	TR_b
171 Blanchard St.	Eureka Construction Co.	1/23/59	500	75	8	90±	Industrial	TR_b
Newark	Celanese Corp. of America	5/16/47	856	778	16	71	Industrial	TR_b
1215 Harrison Ave. Kearny	Theobald Industries	1973	584	350	12	85	Industrial	TR_b
4th & Passaic River Harrison	PSE&G	1932	804	406	12	218	Industrial	TR_b

(1) TR_b = Brunswick Formation

Reference: New Jersey Department of Environmental Protection files

TABLE 3.3.2-1
(Continued)

REPORTED ADDRESS	OWNER	DATE DRILLED	TOTAL DEPTH BELOW SURFACE ELEVATION (ft)	YIELD (gpm)	DIAMETER (in)	DEPTH BELOW SURFACE ELEVATION TO BEDROCK (ft)	USE	FORMATION(1)
1180 Raymond Blvd. Newark	Newark Center Corp.	1955	700	89	10	147	Industrial	TR_b
Harrison	D. L. and WR&R	1952	225	18	6	112	Industrial	TR_b
196 Blanchard St. Newark	International Metallurgical	1980	300	150	6	72	Domestic	TR_b
12 Lister Avenue Newark	ACMC Refinery Company	1960	500	150	10	140	Industrial	TR_b
17 Blanchard St. Newark	Newark Box Board Company	1981	400	105	10	72	Industrial	TR_b
117 Blanchard Ave. Newark	Fairmount Chemical	1968	250	200	8	-	Industrial	-
117 Blanchard Ave. Newark	Fairmount Chemical	1965	300	300	8	66	Industrial	TR_b

(1) TR_b = Brunswick Formation

Reference: New Jersey Department of Environmental Protection files

TABLE 3.3.2-1
(Continued)

REPORTED ADDRESS	OWNER	DATE DRILLED	TOTAL DEPTH BELOW SURFACE ELEVATION (ft)	YIELD (gpm)	DIAMETER (in)	DEPTH BELOW SURFACE ELEVATION TO BEDROCK (ft)	USE	FORMATION(1)
70 Blanchard St. Newark	Newark Paraffin Co.	1968	603	100	8	65	Industrial	TR_b
60 Blanchard St. Newark	Arden Chemical	1962	400	90	8	90±	Industrial	TR_b
Brill Street Newark	Standard Bithulithic Co.	1964	406	360	10	73	Industrial	TR_b
325 Raymond Blvd. Newark	Hildeman Industries	1981	400	38	6	-	Industrial	TR_b
45 Manufacturers Place, Newark	Ronson Metal Corporation	1981	400	150	8	80	Industrial	TR_b
45 Manufacturers Place, Newark	Ronson Metal Corporation	1965	300	220	8	75	Industrial	TR_b
45 Manufacturers Place, Newark	Ronson Metals Corporation	1973	300	150	8	82	Industrial	TR_b

(1) TR_b = Brunswick Formation

Reference: New Jersey Department of Environmental Protection files

TABLE 3.3.2-1
(Continued)

REPORTED ADDRESS	OWNER	DATE DRILLED	TOTAL DEPTH BELOW SURFACE ELEVATION (ft)	YIELD (gpm)	DIAMETER (in)	DEPTH BELOW SURFACE ELEVATION TO BEDROCK (ft)	USE	FORMATION[1]
185 Foundry St. Newark	Arkansas Company	1965	400	65	8	-	Industrial	TR_b
50 Paris St. Newark	Federal Pacific Elec. Prod.	1955	500	250	10	120	Industrial	TR_b
18 Avenue "L" Newark	John Englehorn & Sons	1952	500	450	10	-	Industrial	TR_b
84 Foundry St. Newark	Pfuff & Kendall	1965	200	100	6	-	Industrial	TR_b
Lincoln Hwy. Kearny	Coca-Cola Co.	1981	650	20	6	95	Domestic	TR_b
354 Doremus Ave. Newark	Celanese Chemical Company	1981	700	100	-	-	Industrial	TR_b
260 Schuyler Ave. Kearny	Standard Plastics	1974	250	150	6	105	Industrial	TR_b

[1] TR_b = Brunswick Formation

Reference: New Jersey Department of Environmental Protection files

TABLE 3.3.2-1
(Continued)

REPORTED ADDRESS	OWNER	DATE DRILLED	TOTAL DEPTH BELOW SURFACE ELEVATION (ft)	YIELD (gpm)	DIAMETER (in)	DEPTH BELOW SURFACE ELEVATION TO BEDROCK (ft)	USE	FORMATION(1)
574 E. Ferry St. Newark	Technical Plastic Extruders, Inc.	1981	300	422	8	85	Industrial	TR_b
244 Dukas St. Kearny	WilPet Tool Manufacturing Co.	1961	700	520	10	-	Industrial	TR_b
Bergen Ave. Kearny	Nick Verzaleno	1959	235	150	6	145	Industrial	TR_b
Harrison	Reynolds Metal Co.	1941	467	350	8	78	Industrial	TR_b
100 Schuyler Ave. Kearny	C&A Exxon	1982	25.5	-	4	-	Observation Well	Sand
100 Schuyler Ave. Kearny	C&A Exxon	1982	22	-	4	-	Observation Well	Sand
100 Schuyler Ave. Kearny	C&A Exxon	1982	23	-	4	-	Observation Well	Sand

(1) TR_b = Brunswick Formation

Reference: New Jersey Department of Environmental Protection files

TABLE 3.3.2-1
(Continued)

REPORTED ADDRESS	OWNER	DATE DRILLED	TOTAL DEPTH BELOW SURFACE ELEVATION (ft)	YIELD (gpm)	DIAMETER (in)	DEPTH BELOW SURFACE ELEVATION TO BEDROCK (ft)	USE	FORMATION(1)
Harrison & 7th St. Harrison	Town Park Exxon	1982	33	-	4	-	Observation Well	Sand
Harrison & 7th St. Harrison	Town Park Exxon	1982	32	-	4	-	Observation Well	Sand
Harrison & 7th St. Harrison	Town Park Exxon	1982	32	-	4	-	Observation Well	Sand
Harrison Ave. & Ann St.	Harrison Baking	1981	30	-	4	-	Monitoring Well	Sand
Harrison Ave. & Ann St.	Harrison Baking	1981	30	-	4	-	Monitoring Well	Sand
Harrison Ave. & Ann St.	Harrison Baking	1981	30	-	4	-	Monitoring Well	Sand
Harrison Ave. & Ann St.	Harrison Baking	1981	30	-	4	-	Monitoring Well	Sand
Pennsylvania Ave. Kearny	Monsanto	1983	10	-	4	-	Monitoring Well	Sand

(1) TR_b = Brunswick Formation

Reference: New Jersey Department of Environmental Protection files

TABLE 3.3.2-1
(Continued)

REPORTED ADDRESS	OWNER	DATE DRILLED	TOTAL DEPTH BELOW SURFACE ELEVATION (ft)	YIELD (gpm)	DIAMETER (in)	DEPTH BELOW SURFACE ELEVATION TO BEDROCK (ft)	USE	FORMATION(1)
Pennsylvania Ave. Kearny	Monsanto	1983	10.5	-	4	-	Monitoring Well	Sand
Pennsylvania Ave. Kearny	Monsanto	1983	9.5	-	4	-	Monitoring Well	Sand
Pennsylvania Ave. Kearny	Monsanto	1983	10	-	4	-	Monitoring Well	Sand
Pennsylvania Ave. Kearny	Monsanto	1983	10	-	4	-	Monitoring Well	Sand
500 ft. W. of Jacobus 1/4 mi. N. of Pulaski Skyway	Syncon Corp.	1976	403	-	10/8	-	-	-

(1) TR_b = Brunswick Formation

Reference: New Jersey Department of Environmental Protection files

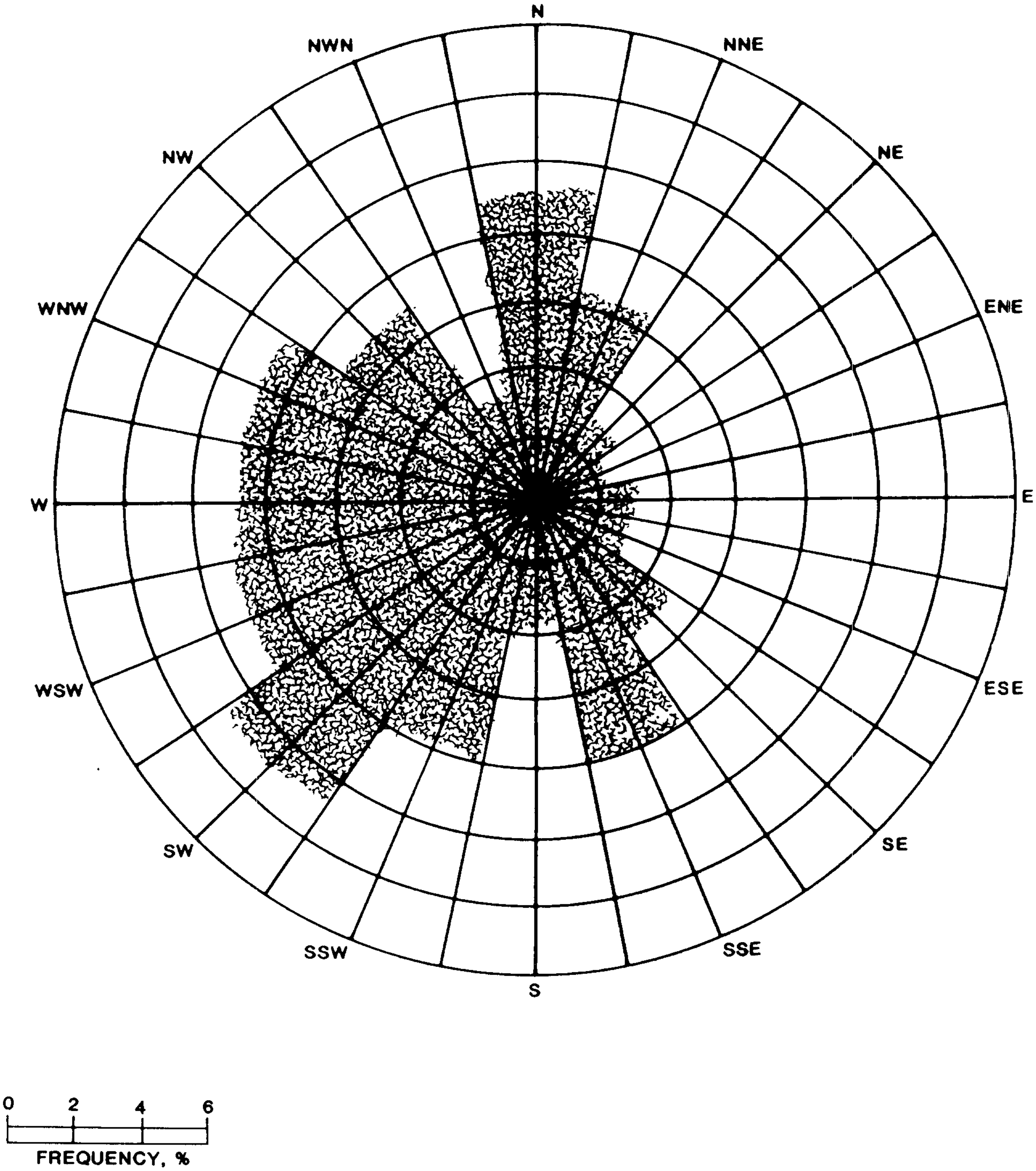
FIGURES

DRAWING NUMBER 846248-A17

CHECKED BY

APPROVED BY

DRAWN BY JJL 1-24-85



REFERENCE: NOAA, 1978

FIGURE 31.2-1

WIND DIRECTION AND FREQUENCY (%)
1965 - 1974

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

Do Not Scale This Drawing

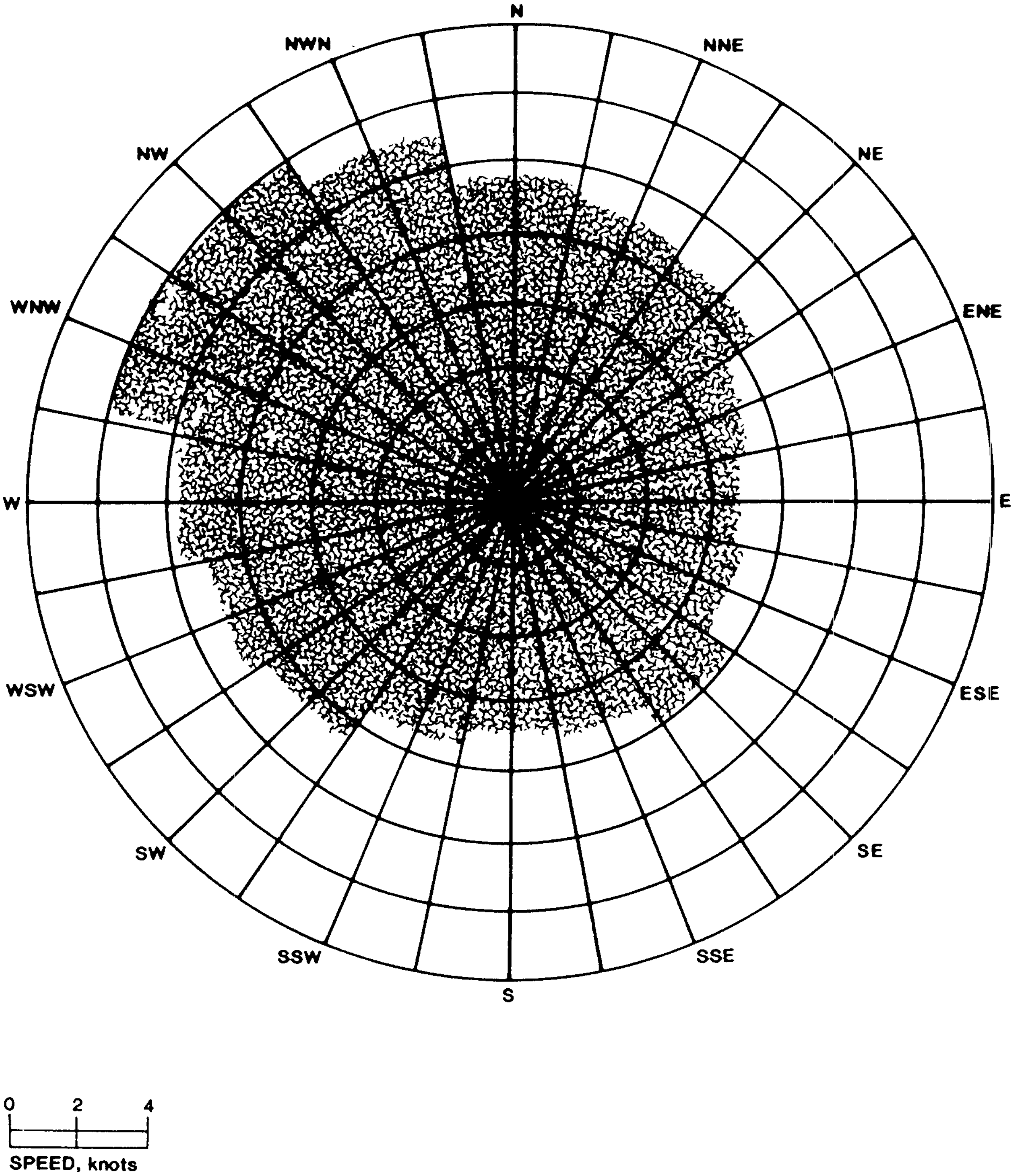
65360

DRAWING NUMBER 846248-A16

CHECKED BY

APPROVED BY

DRAWN BY JJL 1-24-85



REFERENCE: NOAA, 1978

FIGURE 3.1.2-2

AVERAGE WIND SPEED
FOR WIND DIRECTION
1965 - 1974

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

DRAWING NUMBER 846248-A15

CHECKED BY

APPROVED BY

RW 1-24-85

DRAWN BY

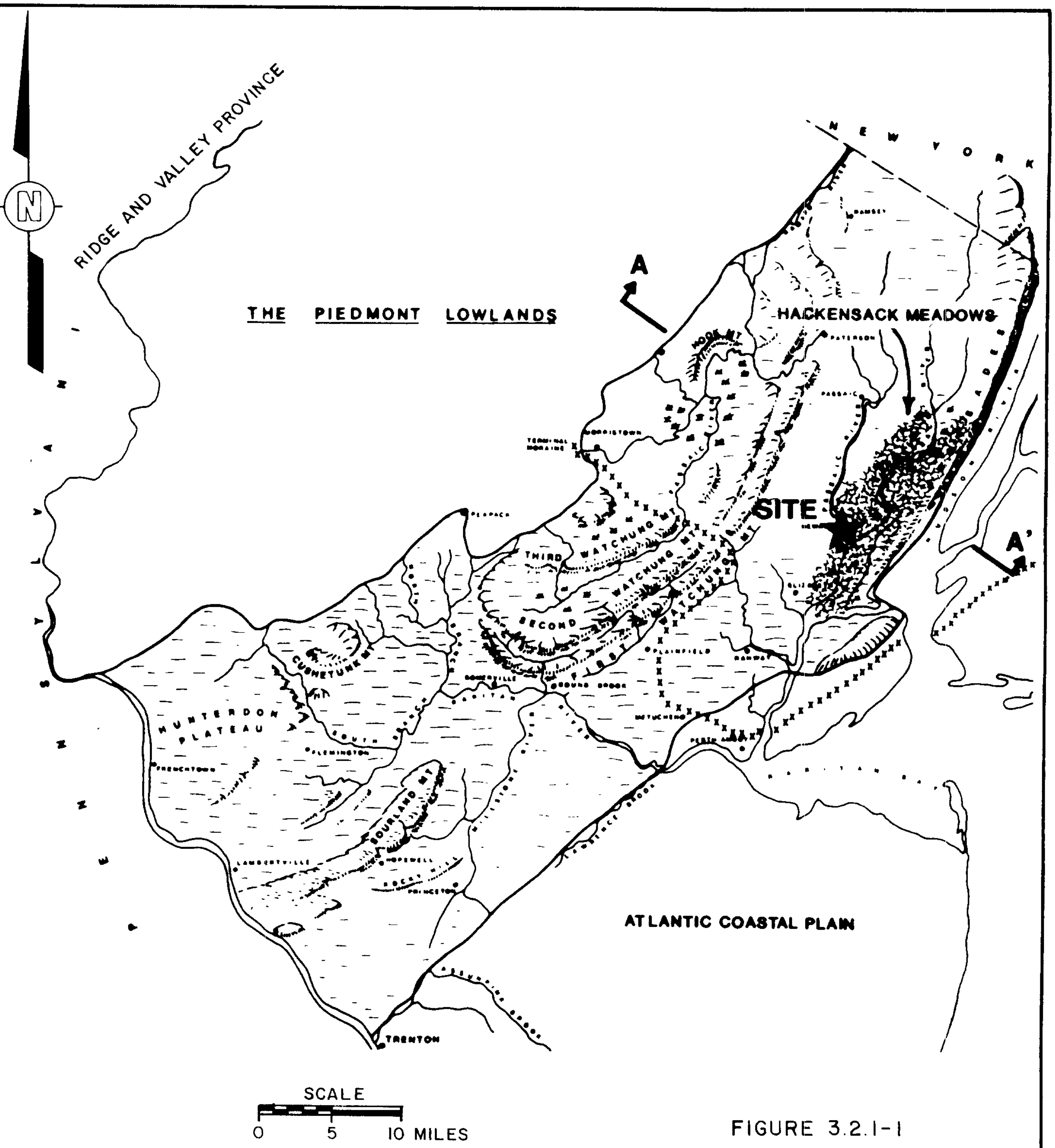


FIGURE 3.2.1-1

LANDFORM MAP OF
THE PIEDMONT LOWLAND PROVINCE

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

NOTE:

FOR GEOLOGIC CROSS SECTION A-A':
REFER TO FIGURE 3.2.2-1

REFERENCE:

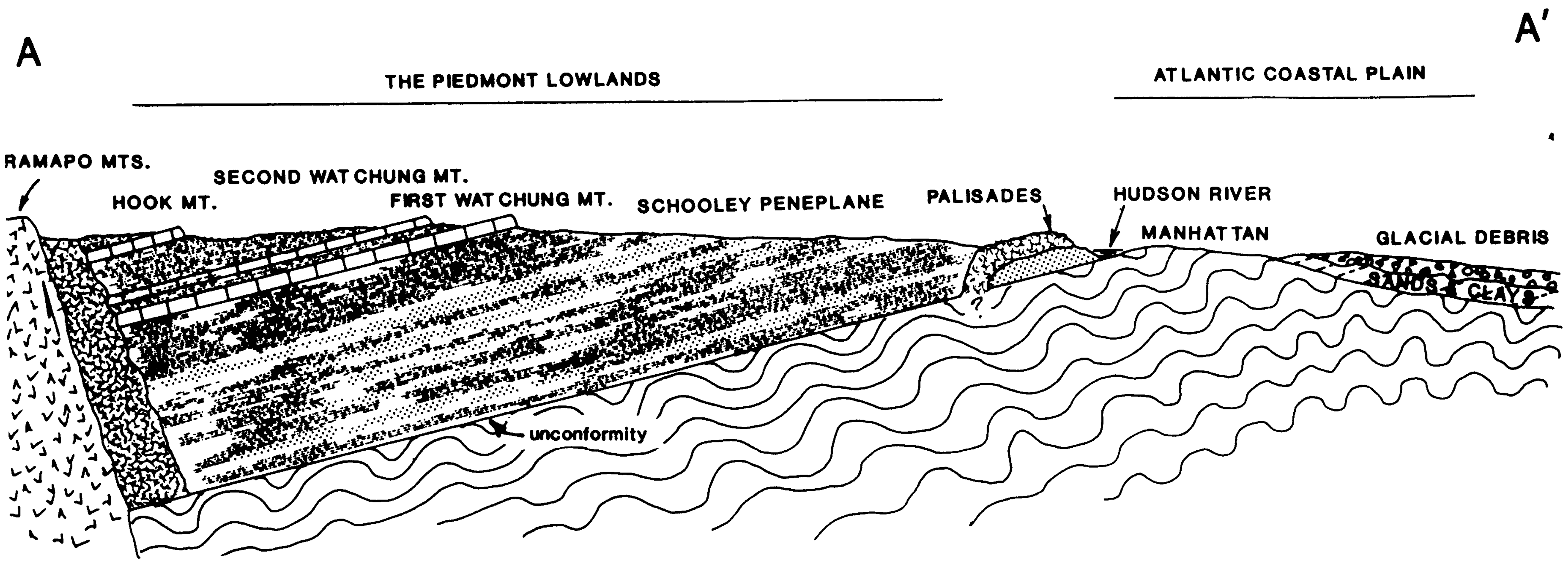
WOLFE, 1977

65360

Do Not Scale This Drawing

IT ... Creating a Safer Tomorrow

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
JJL 1·24·85	JTD 2-13-85	DGE 2-13-85	84624 8-B7



REFERENCE: SCHUBERTH, 1968.

FIGURE 3.2.2-1

GENERALIZED GEOLOGIC CROSS SECTION
OF THE PIEDMONT LOWLAND PROVINCE

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

"Do Not Scale This Drawing"

DRAWING NUMBER 846248-A8

CHECKED BY

APPROVED BY

DRAWN BY RW 1-24-85

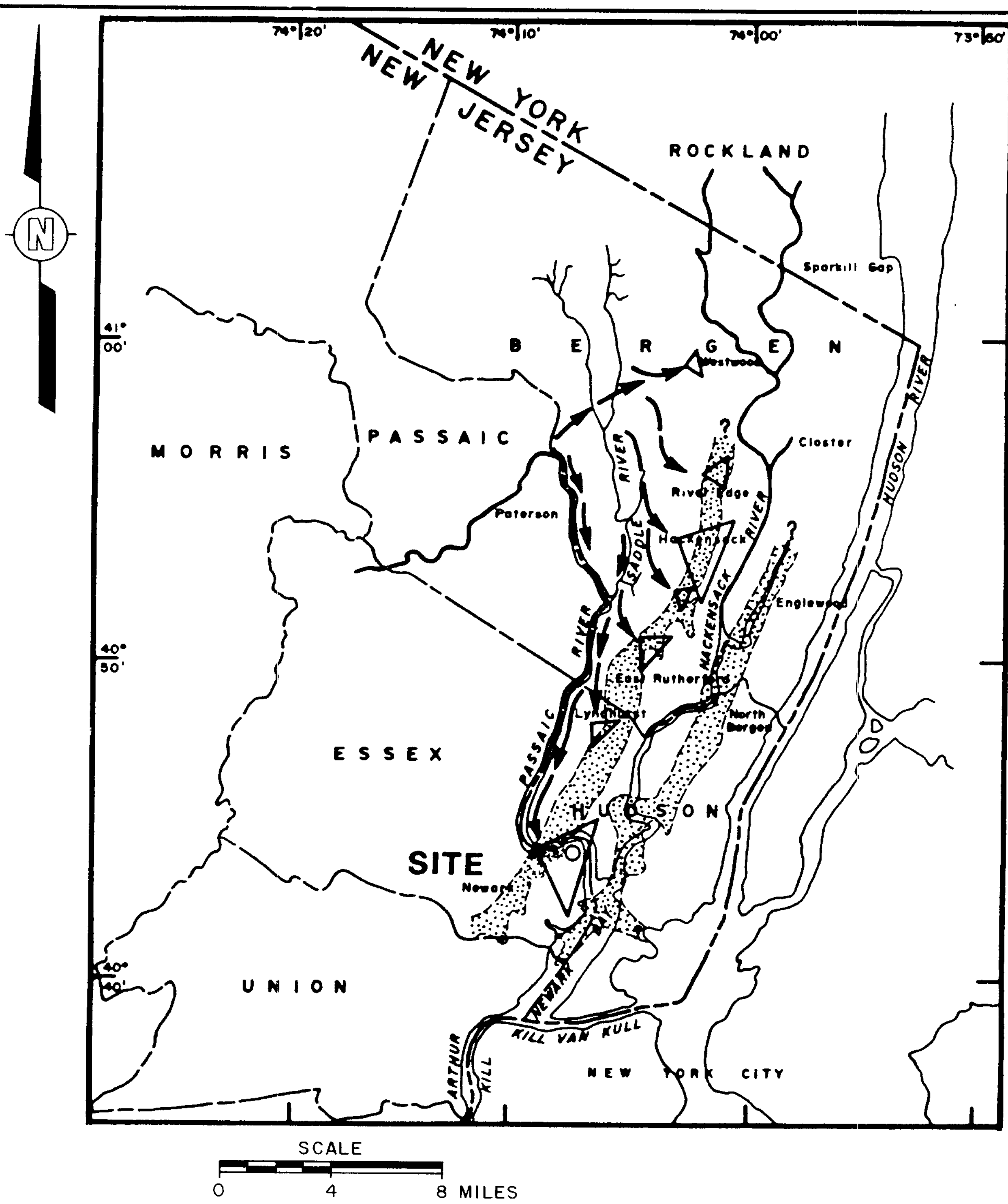


FIGURE 3.2 2-2

LOCATION OF DRAINAGE AND DELTAS FORMED DURING THE RETREAT OF THE WISCONSIN GLACIATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

EXPLANATION

△ Deltas formed during the retreat of the Wisconsin glaciers.

▨ Location of troughs formed prior to the last glacial advance.

➚ Probable location of ancestral drainage during late Wisconsin time.

REFERENCE:

CARSWELL, 1976

IT ... Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

DRAWING NUMBER 846248-A9

CHECKED BY

APPROVED BY

DRAWN BY RW 1-24-85

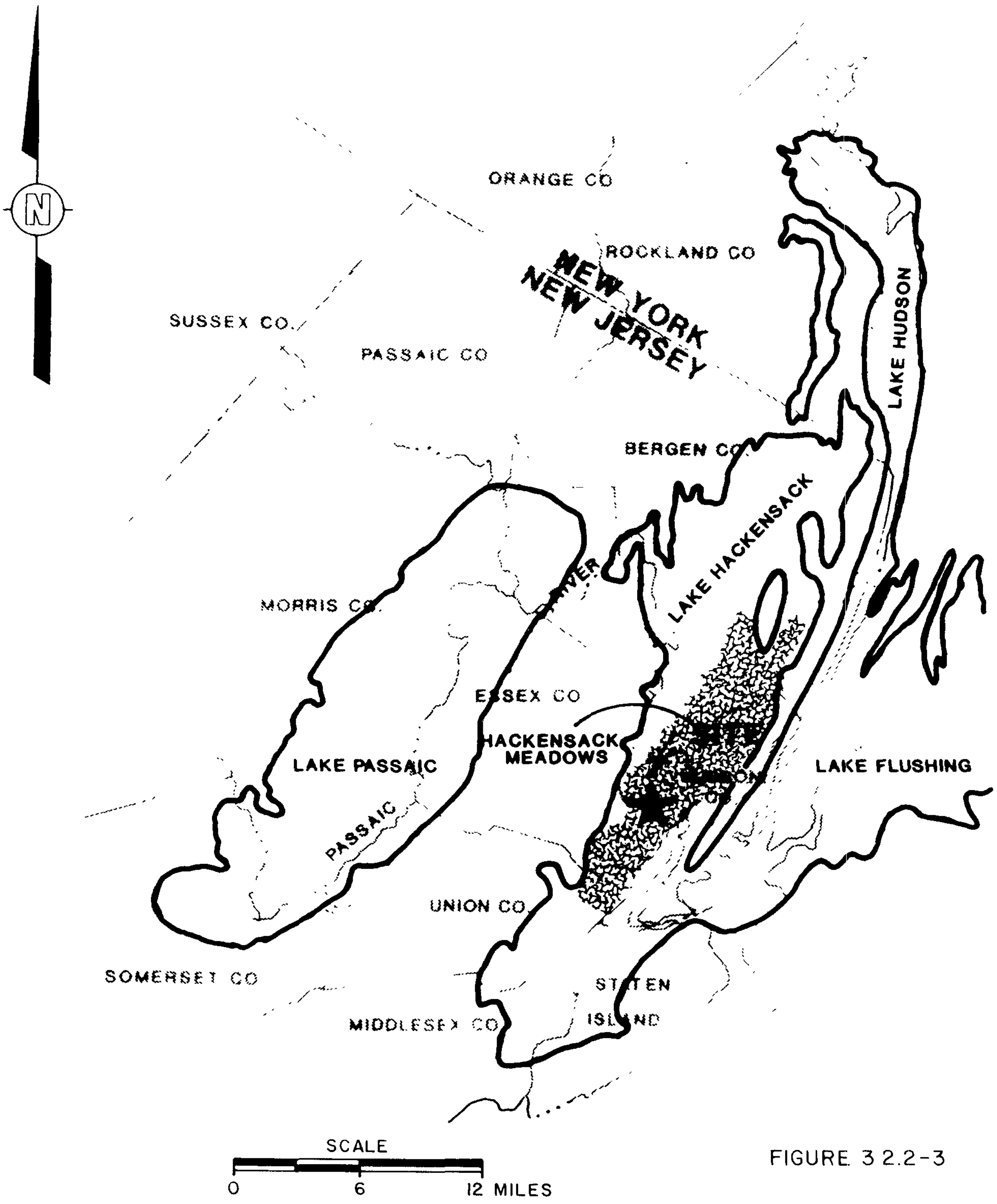


FIGURE 3.2.2-3

EXTINCT GLACIAL LAKES IN NORTHERN NEW JERSEY AND NEW YORK CITY

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

REFERENCE:

WOLFE, 1977 AND VERMEULE, 1896.

65360

IT ... Creating a Safer Tomorrow

Do Not Scale This Drawing

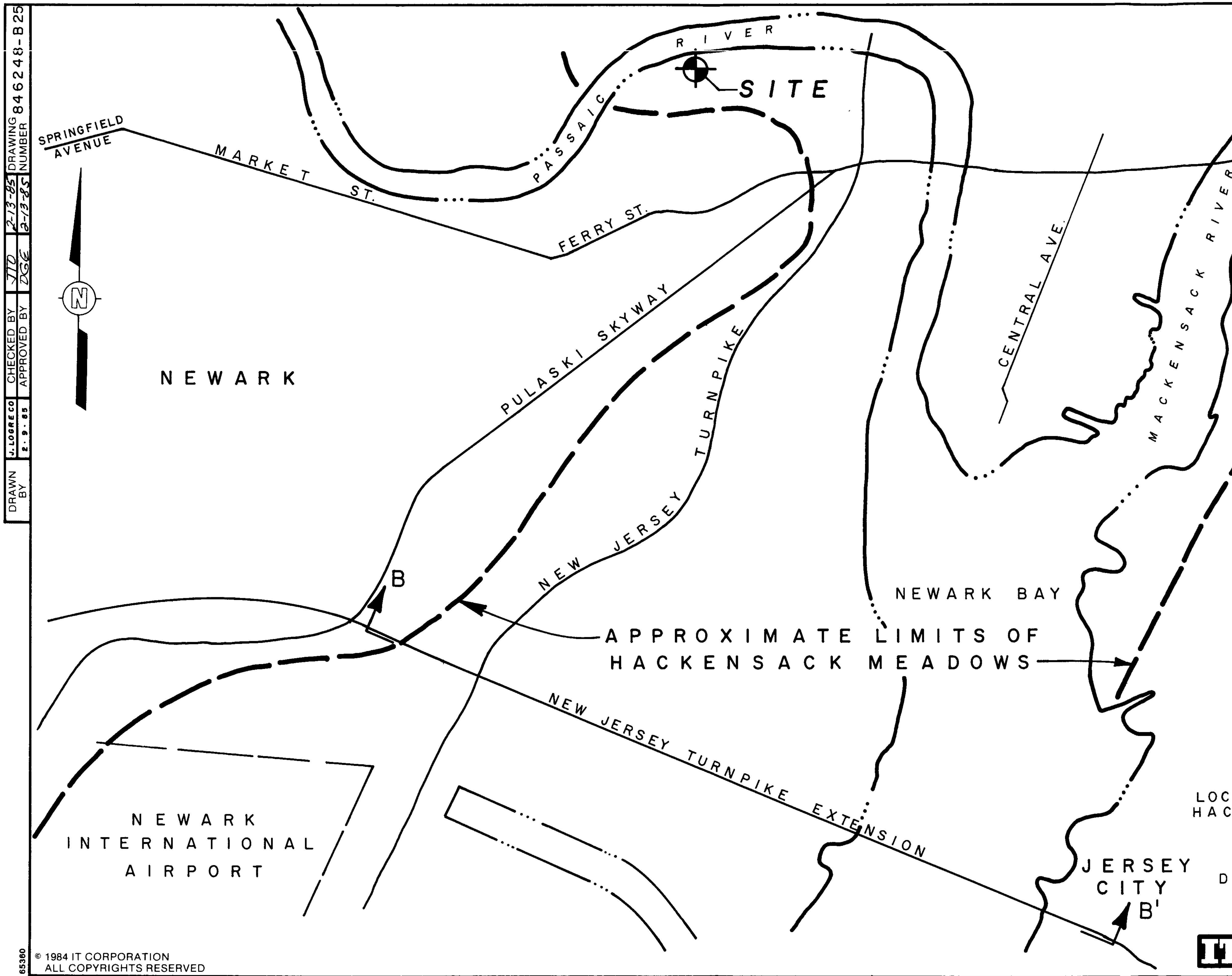


FIGURE 3.2.2-4

LOCATION OF SITE WITHIN HACKENSACK MEADOWS

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

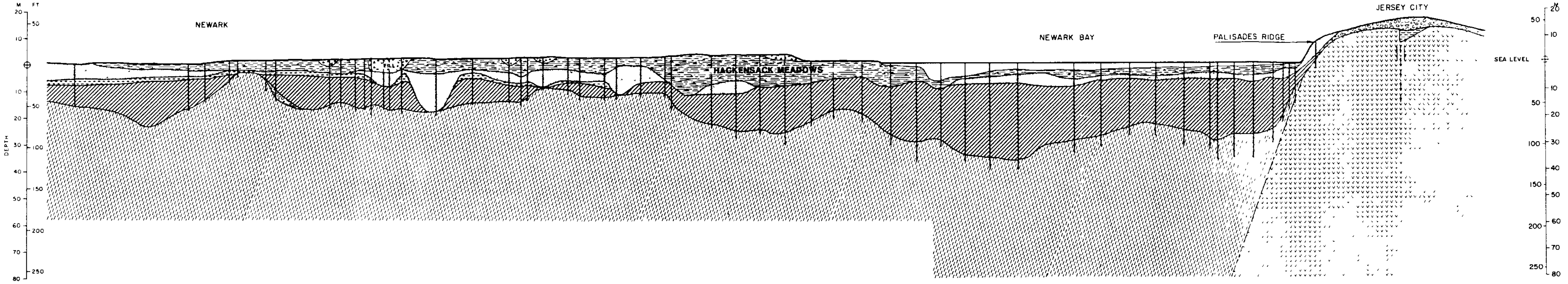
IT ... Creating a Safer Tomorrow

DRAWN BY	J. LOGRECO	2-9-85
CHECKED BY	JTD	2-13-85
APPROVED BY	DGE	2-13-85
DRAWING NUMBER	846248-B25	

65380

"Do Not Scale This Drawing"

DRAWN BY	RW 1-24-85	CHECKED BY APPROVED BY	JTD DGE	2-13-85 2-13-85	DRAWING NUMBER	846248-B26



SECTION B - B'

HOLOCENE

- ▭ WATER
- ▤ GRAY ORGANIC SILT, SOME CLAY, MEADOW MATERIAL, SHELLS
- ▭ YELLOW SILT AND SAND (LOESS)

PLEISTOCENE

- ▩ BROWN SAND
- ▩ DESSICATED REDDISH-BROWN VARVED CLAY AND SILT
- ▨ REDDISH-BROWN VARVED CLAY AND SILT
- ▩ BROWN SILT, SAND, GRAVEL, COBBLES, BOULDERS AND ROCK FRAGMENTS (TILL)

TRIASSIC

- ▨ BRUNSWICK FORMATION Red sandstone
- ▩ PALISADES DIABASE

OTHER

- | LOCATION OF BORING
- — DEFINED CONTACT
- --- APPROXIMATE CONTACT
- ╫ FAULT CONTACT (ASSUMED)

REFERENCE:

LOVEGREEN, 1974

NOTE:

FOR PLAN AND LOCATION OF CROSS SECTION B-B' REFER TO FIGURE 3.2.2-4.

VERTICAL SCALE

0 150 300 FEET

HORIZONTAL SCALE

0 1,500 3,000 FEET

FIGURE 3.2.2-5

GEOLOGIC CROSS SECTION B-B'

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

65360

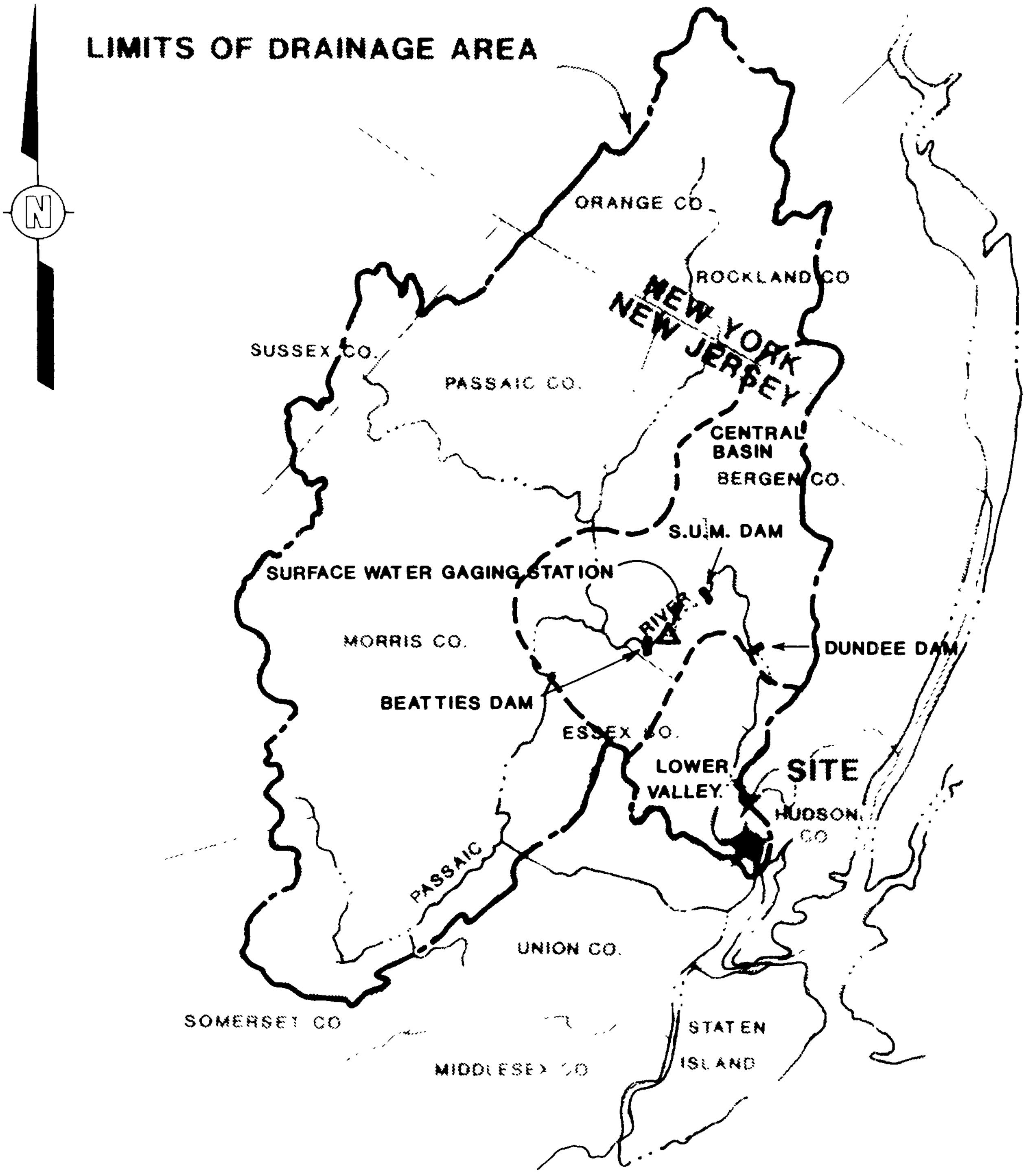
"Do Not Scale This Drawing"

DRAWING NUMBER 846248-A10

CHECKED BY

APPROVED BY

DRAWN BY RW 1-24-85



SCALE

0 6 12 MILES

FIGURE 3.3.1-1

PASSAIC RIVER BASIN

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

REFERENCE:

COE, 1968

65360

Do Not Scale This Drawing

IT ... Creating a Safer Tomorrow

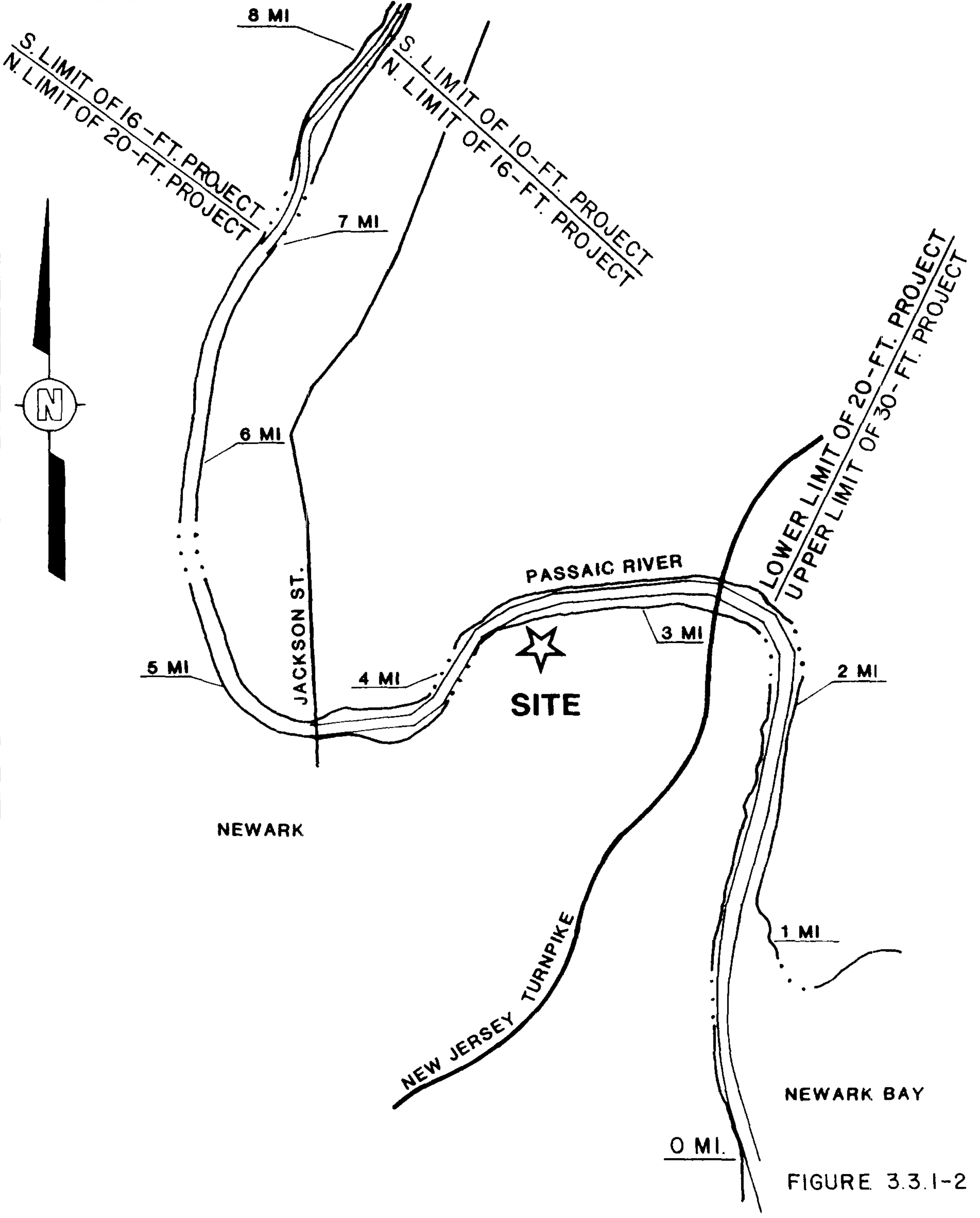


FIGURE 3.3.1-2

SCALE
0 3,000 6,000 FEET

LOCATION OF DREDGING OPERATIONS
IN THE PASSAIC RIVER

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

REFERENCE

COE, 1975

DRAWING NUMBER 846248-A11
CHECKED BY
APPROVED BY
DRAWN BY RW 1-24-85

65360

... Creating a Safer Tomorrow

Do Not Scale This Drawing

Year	Volume of Spoil (cu. yd.)	Where Disposed
1956	550,000	Unknown
1961	518,100	Unknown
1964	596,800	Atlantic Ocean
1971	157,000	Atlantic Ocean
1977	515,500	Atlantic Ocean
1983	961,000	Atlantic Ocean

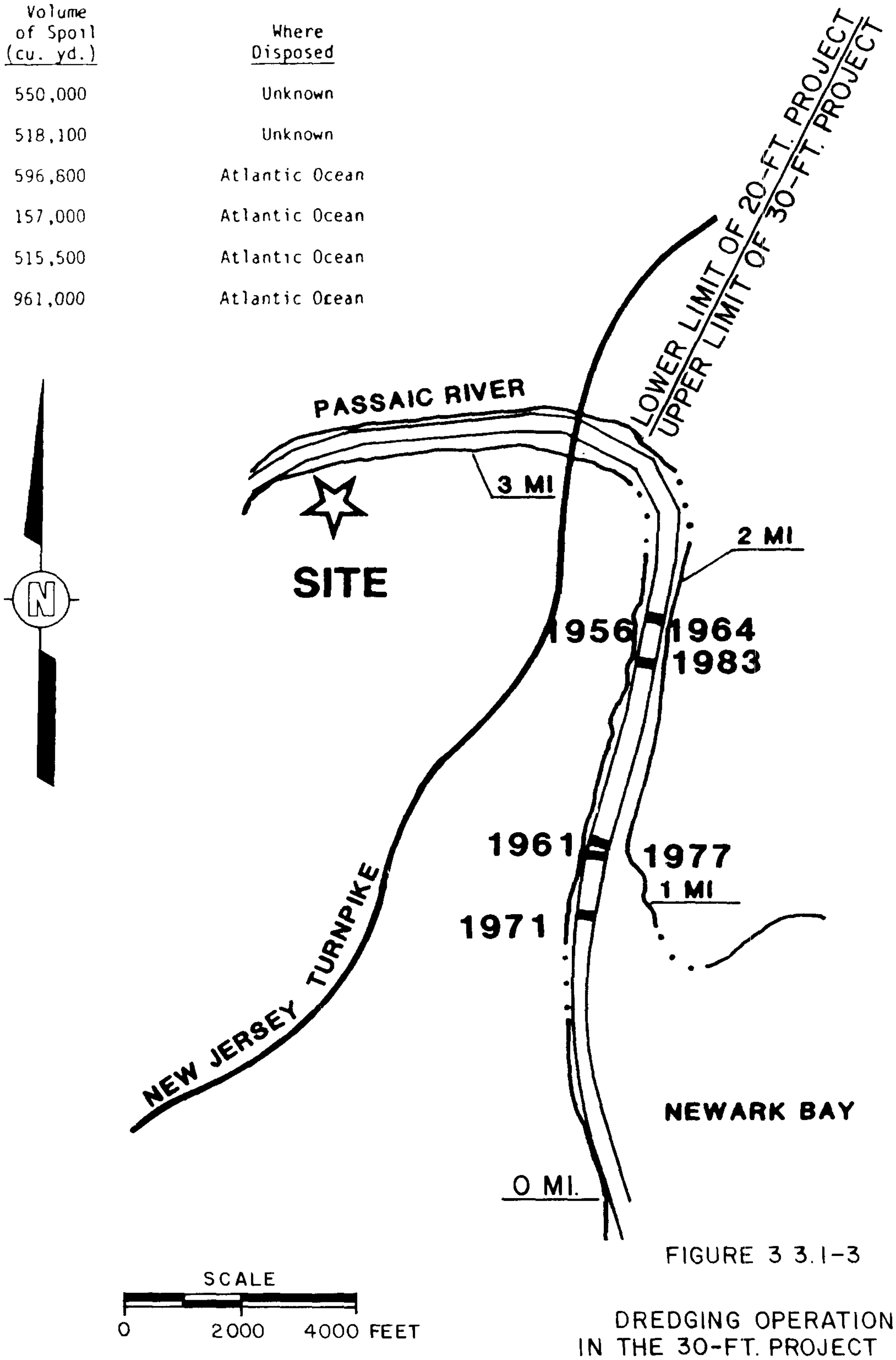


FIGURE 3 3.1-3

DREDGING OPERATIONS
IN THE 30-FT. PROJECT OF
THE PASSAIC RIVER, 1956-1983

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

REFERENCE

COE, 1984

IT ... Creating a Safer Tomorrow

DRAWING NUMBER 846248-A12
CHECKED BY
APPROVED BY
RW 1-24-85
DRAWN BY

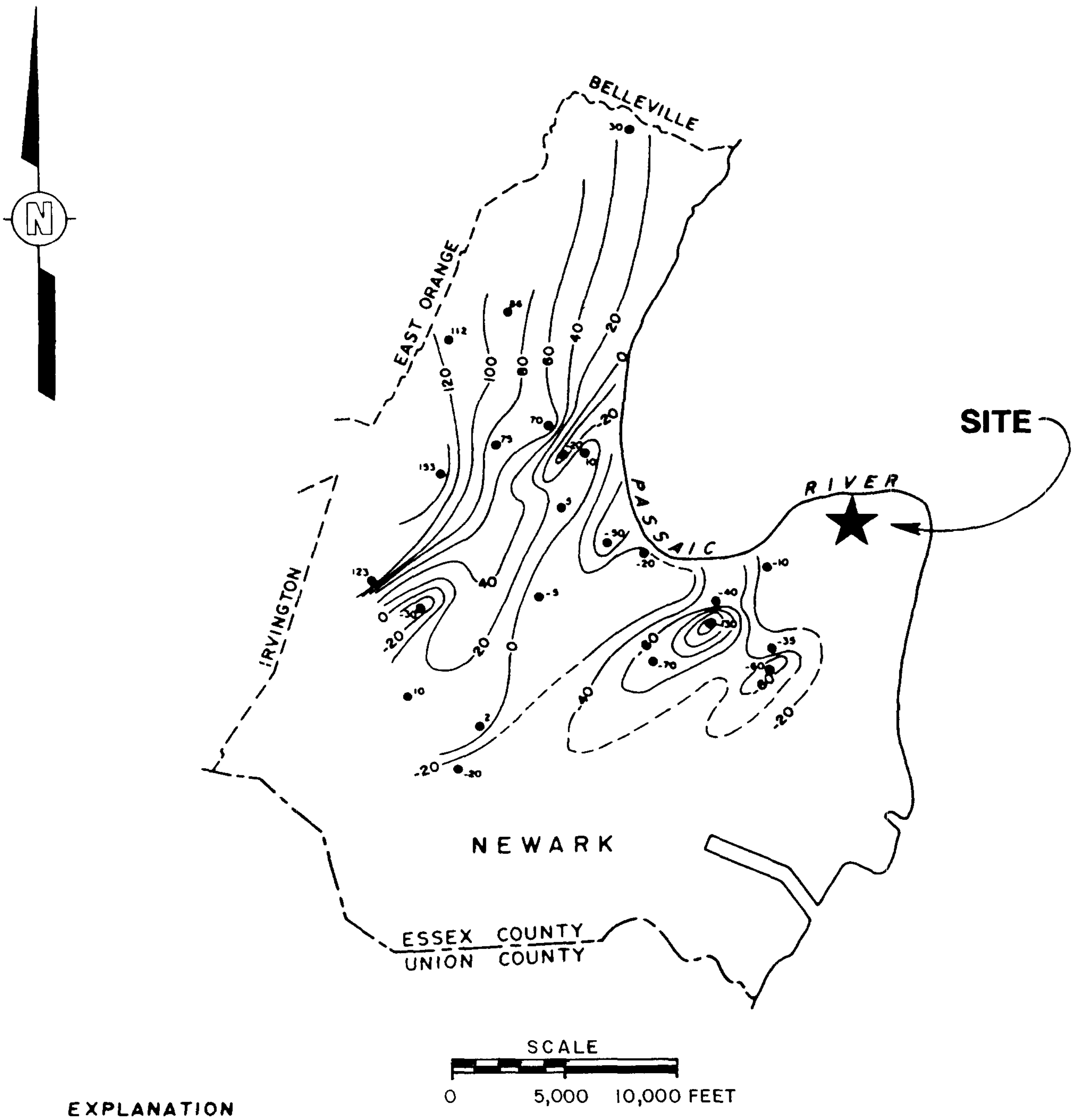
65360

DRAWING NUMBER 846248-A13

CHECKED BY

APPROVED BY

DRAWN BY RW 1-24-85



EXPLANATION

●10
Control well showing altitude of water level; in feet referred to mean sea level.

————-20— — — —
Piezometric Contour
Shows altitude of piezometric surface, dashed where approximately located.

Contour interval 20 feet
Datum is mean sea level

REFERENCE-

NICHOLS, 1968

FIGURE 3.3.2-1

GENERALIZED PIEZOMETRIC CONTOURS OF ESSEX COUNTY 1890 THROUGH 1900

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

IT ...Creating a Safer Tomorrow

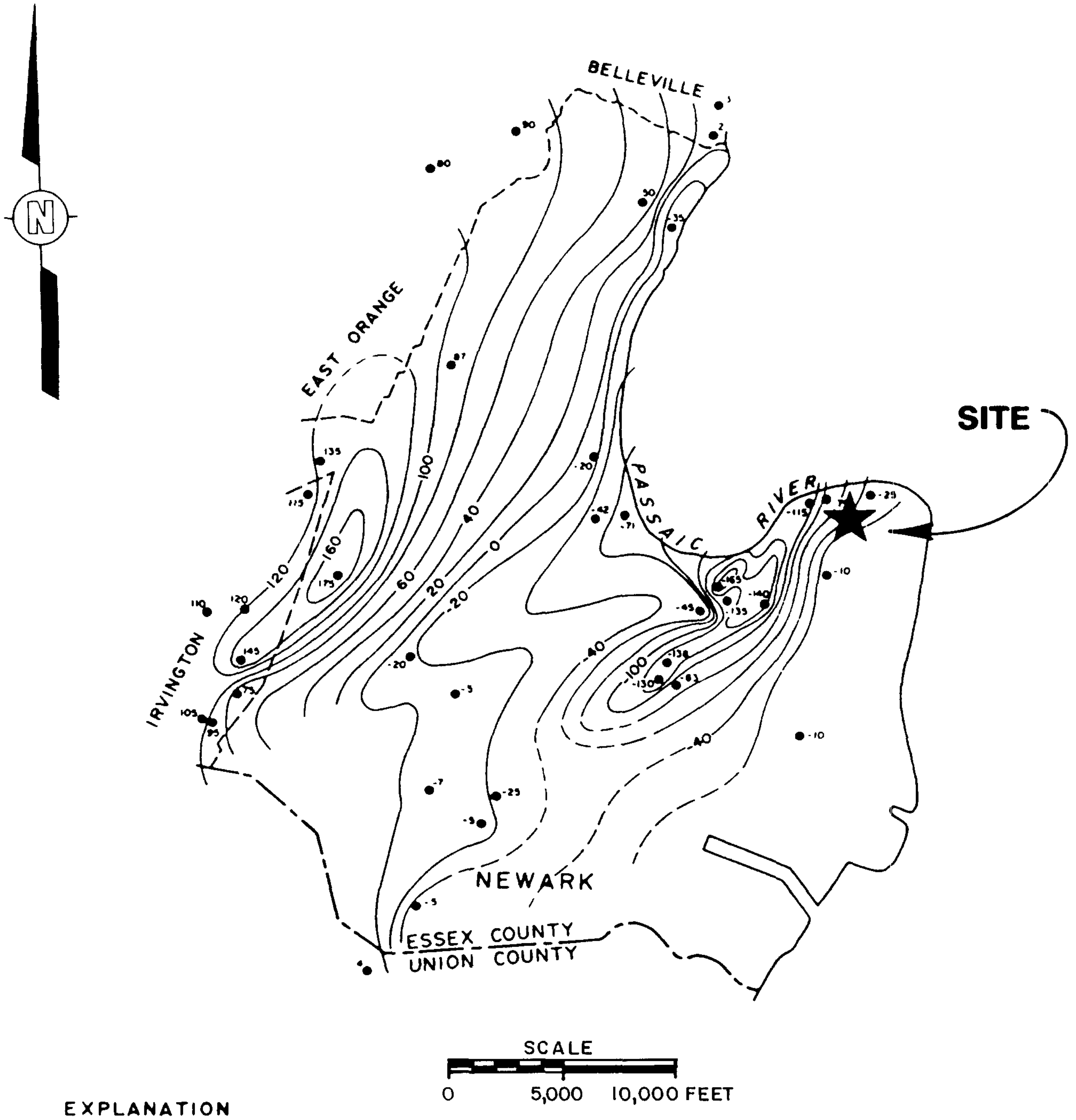
Do Not Scale This Drawing

DRAWING NUMBER 846248-A14

DRAWN BY RW 1-24-85

CHECKED BY

APPROVED BY



EXPLANATION

●10
Control well showing altitude of water level; in feet referred to mean sea level.

———-20— — —
Piezometric Contour
Shows altitude of piezometric surface, dashed where approximately located.

Contour interval 20 feet
Datum is mean sea level

REFERENCE

NICHOLS, 1968

FIGURE 3.3 2-2

GENERALIZED PIEZOMETRIC CONTOURS OF ESSEX COUNTY 1950 THROUGH 1960

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

IT . . . **Creating a Safer Tomorrow**

Do Not Scale This Drawing

DRAWING NUMBER 846248-A20

DRAWN BY J J L 1 25 85

CHECKED BY

APPROVED BY 2-3-85

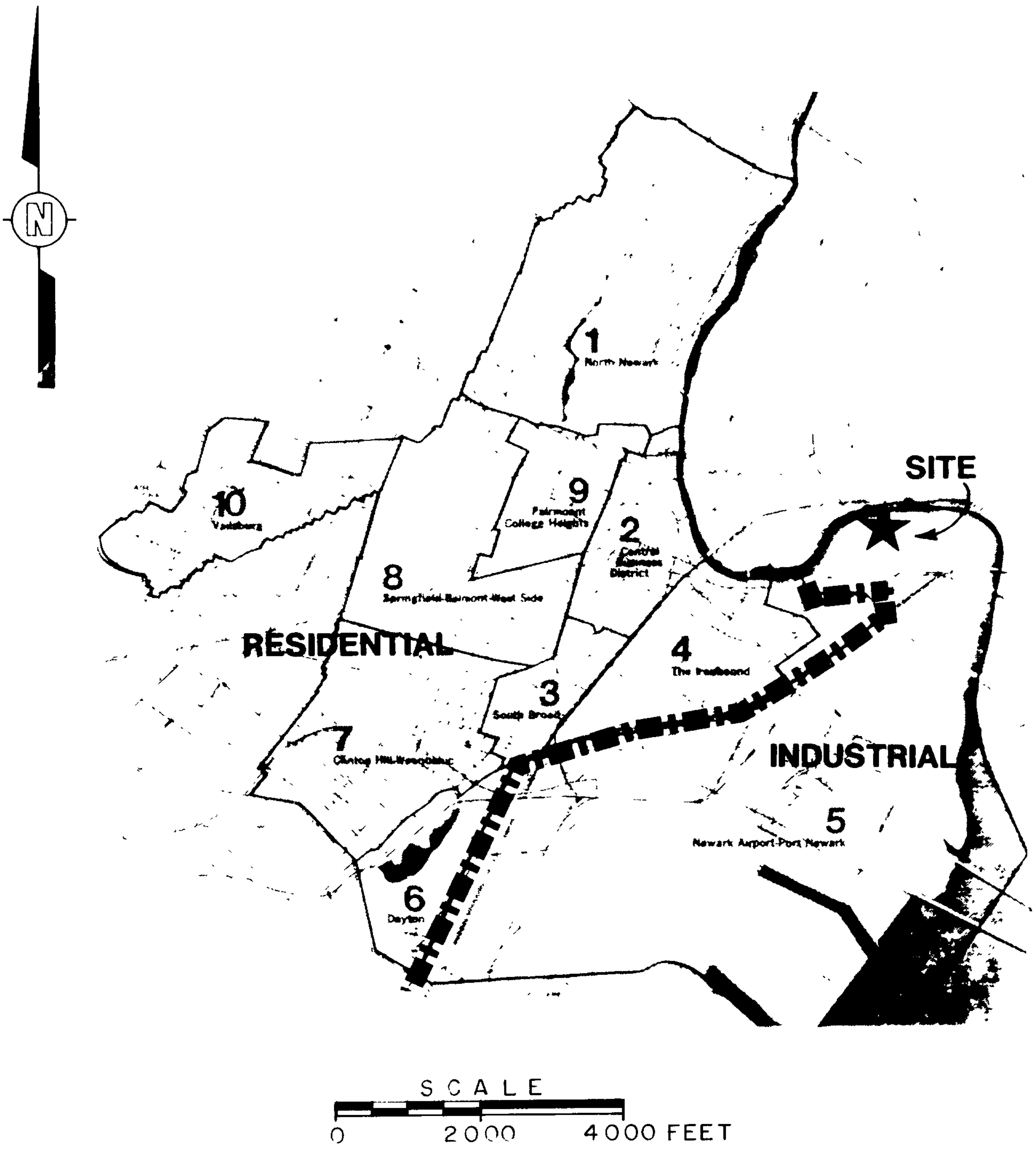


FIGURE 3.5-1

REFERENCE: NEWARK MASTER PLAN, 1978

RESIDENTIAL vs INDUSTRIAL LAND USE

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

4.0

4.0 SITE INVESTIGATION

A comprehensive field investigation and sampling program was developed for the site evaluation. Major considerations in the development of the program included: sampling and analytical testing methodologies; sample collection, handling, documentation and transportation; initiation of a health and safety program to protect project personnel and the general public; and quality assurance/quality control (QA/QC) protocol.

The selection of specific sample locations for soils, buildings and structures was concentrated at those points on the site considered to have the highest potential for the presence of dioxin and/or other contaminants. This biased sampling approach, based on plant historical data, was considered to provide the best data base available for a realistic overall evaluation of the extent of site contamination. A plan of the site showing major buildings and facilities and other physical features is provided in Figure 4.0-1.

A variety of sampling activities was performed to characterize the levels of chemical contamination at the site and to meet required health and safety and QA/QC requirements. These included:

- Ambient air samples
- Industrial hygiene samples
- Chip, wipe, and bulk samples from existing buildings, tanks, piping, equipment, and sewers
- Samples of soil
- Samples of ground water
- Samples of Passaic River water and sediments
- Samples of background soil
- Samples of on-site drums

Because of the large number of samples collected during the field investigation, a designation system was developed to provide unique identification information for each sample, including:

- The location from which the sample was taken. Locations were identified either by a coordinate for soil, sediment, water, and air samples or by a series of numbers for wipe, chip, bulk, and drum samples.
- The position in the numerical sequence of samples taken. Four digits are provided for this number.
- The sample type (matrix).
- The destination of the sample when shipped from the site and the analysis to be performed.

For samples with location identified by coordinates, the alphanumeric sample designation had 12 characters; for samples with location identified by a series of numbers, only 10 characters were required.

A site grid coordinate system was developed to facilitate the location of field sampling points. Grid lines were assigned letters and numbers to provide a means of quickly identifying the area of origin of a particular sample. Further, each 50-by-50-foot grid square was subdivided into sixteen 12.5-by-12.5-foot squares, lettered "A" to "P," as shown in Figure 4.0-2. For samples taken outside of site structures, the first two characters of their designation defined the 50-by-50-foot grid location and the third character defined the 12.5-by-12.5-foot subgrid. It is noted that in a few cases when some of these locations were surveyed after sampling, they did not always exactly correspond to the first three sample designation characters.

When sampling occurred within structures, such as the buildings and the stack, the locations were identified by a four-digit number. The first digit identified the structure, and the remaining three digits identified specific zones within the structure. Because drums are mobile, sequential numbers were assigned to all drums, regardless of their location.

The four-digit sample location numbers were assigned by the Sampling Coordinator before sampling personnel were sent into an assigned area, and this information was recorded in a field log notebook.

Additional information detailing sample identification is provided in Appendix A.

Key project personnel and their major duties and responsibilities during the site investigation included:

- Field Operations Manager - Overall supervision of daily field activities, client and regulatory agency liaison, and responsibility for adherence to programs and schedules.
- Site Manager - Administration of site personnel and equipment, supervision of equipment, and materials purchases and maintenance.
- Sampling Coordinator - Supervision of sample handling staff and responsibility for maintaining proper sample handling techniques, sample shipment, and documentation of sample records.
- Task Supervisors - Supervision of field personnel assigned to specific tasks (i.e., chip samples, drums, near-surface soil samples, etc.) and responsibility for field documentation of these tasks.
- Site Health and Safety Coordinator - Responsibility for the administration of on-site health and safety programs, personnel monitoring, and decontamination procedures.
- QA Program Manager - Responsibility for supervision and documentation of QA/QC program.

Analytical testing for the project was performed at the following laboratories by the IT Analytical Services (ITAS) division of ITC:

Location	Testing
Directors Drive Laboratory Knoxville, Tennessee	Dioxin
Middlebrook Pike Laboratory Knoxville, Tennessee	Inorganics (metals, cyanide, phenols)
Cerritos Laboratory Cerritos, California	Organic Priority Pollutants plus 40

4.1 GENERAL PROGRAMS

4.1.1 Industrial Hygiene

The health and safety program for the site evaluation field investigation included the following activities:

- A Community Public Health Preservation Plan which outlined steps to prevent potential contamination from leaving the site, with telephone numbers of agencies to contact in the event of an emergency.
- A Worker Health Protection Plan which required that all on-site personnel complete a preemployment medical examination and/or a periodic update examination prior to entry to the site. This plan also included procedures to be followed for return to work after an injury or illness.
- A Health and Safety Plan which outlined the health and safety responsibilities, permissible exposure limits for contaminants on site, potentially contaminated and clean site areas, training requirements, employee decontamination procedures, personal protective equipment requirements, atmospheric and physical monitoring requirements, general work practices, methods to control heat stress, drum opening procedures, and guidelines for sampling in the Passaic River.
- A Site Security Plan to prevent unauthorized people from gaining access to the site.

- A procedure to comply with the New Jersey Worker and Community Right to Know Act.
- An Emergency Action Plan which provided detailed procedures in case of an accident or illness on site.

At least one industrial hygienist was on site at all times to coordinate the health and safety program.

4.1.2 Sample Handling and Documentation

A project-specific Standard Operating Procedure (SOP) was developed for all sample handling and documentation. This SOP is provided in Appendix A, and describes in detail field sample collection, the unique identification of samples, the shipping of samples to laboratories for analysis, the documentation associated with all these activities, and the reporting and permanent filing of the analytical laboratory results. Attachments 1 and 2 to Appendix A provide detailed information on sample identification codes and procedures for field log notebook entries, respectively.

A brief summary of sample handling and documentation procedures is provided in the following paragraphs.

Each day's sample collection was planned in advance by the Field Operations Manager. The Sampling Coordinator then assigned an alphanumeric code designation to each sample, and entered them into the Master Sample Collection and Shipping Log. The code designation indicated: sample origin (relative to the site grid), sample type, depth (where appropriate), and laboratory destination(s). Each sample collected was logged into a field log notebook by the person obtaining the sample. A label with the alphanumeric code was attached to the page describing the sample collection.

A Chain-of-Custody record was also initiated at the time of collection by the Sampling Coordinator. When the samples were transferred across the decontamination line to the Sample Handling staff, appropriate entries were made on the Chain-of-Custody records. The Sample Handling staff, under the direction of the Sampling Coordinator, verified collection of each sample in the Master Sample Collection and Shipping Log and packed the samples for shipment to the appropriate laboratories. They also prepared Request for Analysis forms, updated the Chain-of-Custody forms, and shipped the samples to the laboratories with these forms.

Samples collected each day were shipped via overnight carrier for delivery the next day to the analytical laboratories. At the laboratories, the samples were tracked and documented under the routine procedures for each facility. Analytical results were transmitted to the project Analytical Coordinator.

Detailed information concerning sample handling and documentation procedures, particularly that relating to blanks, splits, and replicate samples is provided in Appendix A.

4.1.3 Analytical Quality Assurance/Quality Control

A Quality Assurance (QA) Project Plan, as described in the Work Plan, was developed for the site evaluation to provide a basis for the accurate determination of contaminants in the various samples obtained during the field investigation. The QA plan reflected appropriate EPA guidelines and presented quality assurance objectives for accuracy, precision, completeness, representativeness, and comparability of the analytical data. Specific quality control procedures necessary for protection and verification of sample integrity during collection, preparation, and analysis were described, and details of data validation, reduction, and reporting were also presented.

Some adjustments to the QA Plan were necessary at the beginning of the project due to changes in the scope or objectives of the program, logistical problems, or requests by the NJDEP. These adjustments included redefinition of the collection schedule for sampling equipment rinsates, field blanks, and trip blanks; reassessment of preservation needs and shipment requirements; and revision of the sample custody procedures. The revised QA/QC procedures instituted for these areas are described in the following subsections. In addition, the details of the QC procedures followed during preparation of sample containers are provided. Finally, a description of the requirements for QC check samples at the participating laboratories is presented, and the QC checks initiated at the program level are described.

4.1.3.1 Field and Trip Blank Requirements

For this project, a field blank was defined as laboratory-pure water poured over a piece of sampling equipment and caught in an empty sample container on site. A field blank was obtained by a sampling team member immediately prior to the start of each day's collections. The field blank is identical to the "equipment rinsates" described in the original QA Plan. The water and containers for field blanks were provided daily to the sampling teams by the Sampling Coordinator, who received them from the Middlebrook Pike laboratory.

Trip blanks consisted of laboratory-pure water provided to the sampling teams in sealed sample containers; the containers were filled at the Middlebrook Pike Laboratory, labeled by the on-site Sampling Coordinator, and issued daily to the sampling teams. They were handled in exactly the same manner as the field samples, but the containers were not opened on site for any reason.

The frequency requirement requested by the NJDEP for field and trip blanks, was one field blank and one trip blank per day. Blanks associated with soil and river sediment samples were routinely analyzed for volatile organics only; additional blanks were included for analysis of other parameters in the program level QC Plan. Blanks associated with water samples were analyzed for all EPA priority pollutant (PP) parameters. An overall goal of five percent of the total number of samples collected was established as the collection frequency for routine field and trip blanks.

Field blanks associated with chip sampling were assigned in a similar fashion, but were analyzed for dioxin only. Field blanks associated with wipe samples consisted of a clean wipe which was soaked with solvent on site and placed in a prepared container. These were also analyzed for dioxin only.

4.1.3.2 Sample Preservation and Shipment

Because of the potential for dioxin contamination, most site samples were packaged and shipped as "Poison B," which made it impossible to refrigerate them adequately between collection and arrival at the laboratories. Therefore, all samples for which Poison B packaging was required (Table 4.1.3.2-1) were not refrigerated until they were received at the laboratories. Samples designated nonhazardous were shipped in ice chests under cooled conditions.

Other preservation techniques were performed prior to sample collection as work assignments were made. These are defined in Table 4.1.3.2-2.

4.1.3.3 Sample Custody Requirements

A detailed description of the custody procedures followed throughout the project is provided in Subsection 4.1.2 and Appendix A. The only important modification to the scheme detailed in the Work Plan was that the Chain-of-Custody records were initiated prior to sample collection by the Sampling Coordinator. The Chain-of-Custody records were carried into the field where the field sampling personnel recorded the date, time, and amount collected as the samples were taken. They were then returned to the Sampling Coordinator with the samples. As the field sampling personnel released the samples to the sample handling personnel, they signed the Chain-of-Custody records, marking the first custody transfer.

4.1.3.4 Sample Container Preparation

All sample containers used at the site were supplied by the Middlebrook Pike laboratory. The containers were cleaned prior to shipment to the site according to the procedure described in the Work Plan. One container from each set of 40 was rinsed with laboratory-pure water, and the rinsate was analyzed for the same parameters as the sample to be collected in that type of container. Lot designations indicating the check analysis performed were assigned to each set of 40 containers and these were written on the boxes, indicating the check analysis performed:

DX _ _	Dioxin
AA _ _	Metals
PP _ _	All PP parameters (used for soil containers)
EO _ _	Extractable Organics
PO _ _	Purgeable Organics
CN _ _	Cyanide
OH _ _	Phenols.

The last two characters of the lot designation indicate the lot number. As containers were issued to sampling teams on site, the lot designations were recorded in the Master Sample Collection and Shipping Log. Records including preparation dates, analytical data, and final results verifying container quality were filed with the project data.

4.1.3.5 Laboratory Quality Control Checks

Samples collected from the site were shipped directly to one or all of the three participating IT Analytical Services laboratories for analysis. EPA Contract Laboratory Program (CLP) methods were used for analysis of dioxin and the organic priority pollutants, as described in the Work Plan, with stated modifications in the case of the dioxin analyses. Herbicides, metals, cyanides, and phenols were analyzed by standard EPA methods, also described in the Work Plan. Other analyses included asbestos, industrial hygiene parameters, and ambient air parameters, for which appropriate EPA and NIOSH methods were employed.

Similar laboratory QC check frequency requirements were used throughout the investigation. As a minimum, for each group of 20 samples received of a particular matrix, a laboratory method blank or blind sample split, and a sample or blank spike were analyzed. For all organic analyses (dioxin, volatiles, and semivolatiles), internal and surrogate standards were added to each sample to monitor instrument performance and method recovery. For all analyses, reference standards were run at least once during every eight-hour shift. Table 4.1.3.5-1 summarizes the QC check requirements for each sample matrix and analysis.

In addition to the above, the NJDEP On-Scene Coordinator (OSC) directed the selection of samples to be split at the time of collection for independent analysis by NJDEP and ITC. A split frequency of five percent of all samples collected was established by NJDEP (Table 4.1.3.5-1).

Field blanks and trip blanks were also obtained on site, as previously described in Subsection 4.1.3.1.

4.1.3.6 Program Level Quality Control

In addition to the on-site and laboratory QC checks already described, a special set of samples was initiated by the QA Program Manager over the course of the project. The program level QC was designed to monitor the performance of the overall program, including sampling, documentation, shipment, and analysis. Several different types of samples were included in the program, as described in the following paragraphs.

4.1.3.6.1 Non-VOA Field Blanks

Routine field blank requirements included analysis of volatile organics for blanks associated with soil and sediment samples only. Between October 9 and October 23, 1984, 10 additional field blanks were randomly assigned in conjunction with the usual VOA blanks for analysis of metals, cyanides, phenols, semivolatiles, and dioxin (two blanks for each parameter).

4.1.3.6.2 Blanks

A set of three unused gauze wipes was prepared at the Directors Drive laboratory as blank samples. They were assigned label numbers by the QA Program Manager and inserted into the on-site schedule for shipment with routine site samples to the laboratory for analysis of dioxin. Similarly, a set of three soil samples (Clarksburg soil, clean with respect to dioxin, originally obtained from Mason & Hanger-Silas Mason Company, Inc., EPA-OHMSETT Facility, Leonardo, New Jersey) were obtained from the Directors Drive laboratory, labeled, and inserted into the routine on-site schedule for shipment to the laboratory for dioxin analysis.

4.1.3.6.3 Blank Spikes

Three dioxin-spiked wipes and three dioxin-spiked soils were issued concurrently with the blank samples described above.

Spiked wipe samples were prepared at the Directors Drive laboratory by soaking unused gauze wipes with solvent, then injecting 40 nanograms (ng) of dioxin directly onto each wipe. Samples were then individually labeled and inserted into the routine on-site schedule for shipment back to the laboratory for dioxin analysis.

Clarksburg soil spiked with 671 ppb of dioxin was obtained from the Directors Drive laboratory. The soil was spiked as part of a study performed for the USEPA-OHMSB by ITC (ITC, 1983). The dioxin level of 671 ppb was established by multiple analysis at the Directors Drive laboratory. Three aliquots of the spiked soil were provided, individually labeled, and inserted into the normal on-site schedule for sample shipment to the laboratory for dioxin analysis. Documentation provided with these samples indicated that a high level of dioxin was expected, to allow the lab to choose an appropriate sample size for extraction.

4.1.3.6.4 On-Site Directed Splits

A total of 10 samples were split at the time of collection at the direction of the QA Program Manager for duplicate analysis of assigned parameters. Distinct sample numbers were assigned by the Sampling Coordinator to facilitate blind analysis at the laboratory level. Following is a breakdown of the splits by sample matrix and analyses requested:

Matrix	No. of Splits	Percent Frequency	Analysis Parameters
Chip	3	4.1	Dioxin
Soil	3	5.3	Dioxin
Soil	3	3.7	All Parameters
Water	1	5.3	All Parameters

The percent frequencies listed are based on the total number of samples of each matrix collected for each requested analysis.

4.1.3.6.5 ITC Interlaboratory Splits

Two soil samples and one water sample were split at the time of collection to produce two extra aliquots of each sample, one for a duplicate analysis of metals, cyanides, and phenols, and the second for duplicate analysis of all organic priority pollutants. All duplicate analyses for the inorganic parameters were performed at the Cerritos laboratory; duplicate analyses for the organic parameters were performed at the Middlebrook Pike laboratory. Each laboratory also performed the normal analyses (organics at Cerritos, inorganics at Middlebrook Pike) on the original samples.

4.1.3.7 Corrective Action

Results for quality control check samples (in particular, field and trip blanks) were reviewed, as available, over the course of the project. Corrective actions were taken on an as-needed basis, including reanalysis of reextraction samples and resampling some locations when field blanks indicated potential contamination.

4.1.4 Analytical Methods

The methods used for the analysis of samples were either EPA or other approved analytical procedures. These methods were presented in detail in the Work Plan and significant modifications were not required during the analyses of the samples. Table 4.1.4-1 presents the matrices and the analytical parameters for which analysis was performed. Table 4.1.4-2 lists by parameter the analytes for each analysis.

As referred to in this report, priority pollutants are the organic base/neutral/acid (BNA) analysis, volatile organic compounds (VOC) analysis, pesticides and PCBs analysis, herbicide analysis, metals analysis, total cyanides, and total phenols. The BNA's, VOC's, and the pesticides and PCB's were analyzed according to the EPA Contract Laboratory Program (CLP) organic analysis requirements. Additionally, 40 extraneous peaks (as defined in the Work Plan) in the BNA and VOC analyses were library searched. All results were produced and reported according to the CLP protocols. The herbicides, metals, total cyanide, and total phenols were analyzed by EPA (1979, 1982) methods for waste analysis.

Dioxin was analyzed according to EPA protocols for dioxin in soils. Appropriate modifications were made for analyses of matrices other than soils. Detailed procedures are provided in the Work Plan. In addition to the analysis of dioxin, 10 percent of the soils (near surface and borings) and river sediments were analyzed for 2,3,7,8-tetra-chlorodibenzofuran and octachlorodibenzo-p-dioxin. Procedures for these methods are also provided in the Work Plan.

Ambient air samples were analyzed for specific analytes as noted in Table 4.1.4-2. The groups of parameters for which analyses were performed included: total suspended particulate matter (TSP); inhalable particulate matter (IPM); metals; volatile organic compounds, polycyclic aromatic hydrocarbons (PAH); asbestos; dioxin; and pesticides and other chlorinated organics. The PAH's were analyzed by high-performance liquid chromatography (HPLC) using EPA Method 610. Volatile organic compounds and vinyl chloride were analyzed by applicable EPA methods. Asbestos, IPM, TSP and metals were analyzed using NIOSH P&CAM methods. Pesticides and other chlorinated organics were analyzed by standard extraction procedures for air filters and reference standards were utilized for quantitation. Not all standards for compounds identified in the Work Plan were commercially available and analyses were only performed based on the available standards. Table 4.1.4-2 lists those compounds that were analyzed for this investigation.

Drum samples were tested for hazardous categorization (Hazcat), which is a series of physical property tests that evaluate water reactivity and solubility, vapor pressure, pH, presence of oxidizable materials, presence of peroxides, open-cup ignitability, and open cup flash point. These test results were used to determine if materials found in the drums were similar. After evaluation of the hazardous categorization, selected drums, representative of larger groupings, were analyzed for dioxin.

In general, most samples from the site were analyzed for dioxin regardless of the concentration or background interference. Every effort was made to achieve a clear definable result. Modifications to the dioxin analyses were made either at the request of or by permission from representatives of the NJDEP. These modifications included the following:

- Nondetected (ND) analysis would have a detection limit of 0.78 ppb rather than 1.0 ppb
- The effective acceptable linear instrumental calibration range was extended by 20 percent

- Samples having concentrations sufficiently out of the linear calibration range would be reanalyzed as a one gram sample

- One-gram samples that were still out of the linear calibration range would have their extracts diluted.

If reanalysis was required to obtain results within the linear calibration range, but insufficient or no sample remained after the initial analysis, only a dilution of the extract was performed.

4.2 SAMPLING, MONITORING, AND PHYSICAL TESTING

4.2.1 Ambient Air

Ambient air sampling was conducted at the site for establishing baseline conditions and for comparison of site data to data collected by the NJDEP at other sites in the Newark area.

A single air sampling location, the roof of the office/laboratory building, was utilized for the baseline sampling. This location (Figure 4.2.1-1) was approximately 10 meters above ground level and on the southern end of the site. Data from this single sampling location is considered representative of baseline ambient concentrations at the site because of the wind exposure at this point.

The samples and monitoring data were collected over 24-hour periods for 31 consecutive days beginning at noon on September 8, 1984, and ending at noon on October 9, 1984. Data were collected for a 31-day period so that an indication of the range of variation could be obtained.

The sampling and monitoring program included the measurement of the following parameters:

- Total Suspended Particulate Matter
- Inhalable Particulate Matter
- Metals

- Volatile Organic Compounds
- Polycyclic Aromatic Hydrocarbons
- Asbestos
- Dioxin
- Pesticides and Other Chlorinated Organics
- Wind Speed and Wind Direction.

Six individual sampling trains and one meteorological instrument were used to accomplish the air sampling and monitoring. A high volume air sampler was utilized to measure total suspended particulate matter (TSP) and polycyclic aromatic hydrocarbons (PAH). TSP was sampled according to the EPA "Reference Method for the Determination of Suspended Particulates in the Atmosphere" (High Volume Method) (CFR, 1975). Ambient air was drawn into a covered housing and through an 8x10-inch glass fiber filter by means of a high flow-rate blower. The sampling flow rate was maintained between 1.1 and 1.7 cubic meters per minute to allow suspended particulate having diameters of less than 100 microns to pass to the filter surface. The high volume air sampler was equipped with a constant flow control to enable mass concentration to be measured accurately, an elapsed-time indicator to accurately record sampling time period, and a pressure transducer flow recorder to continuously record pressure drop across a calibrated orifice. TSP concentration was computed by measuring the total particulate mass collected and the total air volume sampled. PAH compound concentrations were computed by determining the total mass of individual compounds collected and the total air volume sampled. Figure 4.2.1-2 is a schematic diagram of the high volume air sampler.

A high-volume air sampler equipped with a 10-micron size selective inlet was utilized to measure inhalable particulate matter (IPM) and metals concentrations. Ambient air was drawn through the circumferential inlet of the size selective inlet at a flow rate of 1.13 cubic meters per minute. Suspended particles were accelerated through multiple circular impactor nozzles resulting in the collection of particles larger than the 10-micron impactor cut-point on the impaction surface. Particles smaller than 10 microns turned with the air stream up into the impaction chamber and down through multiple vent tubes to the 8x10-inch glass fiber filter.

The high volume air sampler used was equipped with a constant flow control to maintain the 10-micron size selective inlet impactor cut-point, an elapsed-time indicator to accurately record sampling time period, and a pressure transducer flow recorder to continuously record pressure drop across the calibrated orifice. IPM concentration was computed by measuring the particulate mass collected and the total air volume sampled. Metals concentrations were computed by determining the total mass of individual metals collected and the total air volume sampled. Figure 4.2.1-3 is a schematic diagram the high-volume air sampler equipped with a 10-micron selective inlet.

A polyurethane foam (PUF) sampler was utilized to measure concentrations of dioxin, pesticides, and other chlorinated organics. Ambient air was drawn into a covered housing and through a dual-chambered aluminum sampling module. The upper chamber of the sampling module supported a four-inch diameter glass fiber filter used for collecting airborne particulates. The lower chamber consisted of an enclosed glass cartridge containing a 60-mm diameter by 75-mm-long cylindrical polyurethane foam plug for vapor entrapment. The sampling flow rate was approximately 0.25 cubic meter per minute. The PUF sampler was equipped with a calibrated venturi and magnehelic gage to measure flow rate, a voltage variator to adjust blower motor speed, and an elapsed-time indicator to accurately record sampling time period. Concentrations of dioxin, pesticides and other chlorinated organics were computed by measuring the total mass of each individual compound collected and the total air volume sampled. Figure 4.2.1-4 is a schematic diagram of the PUF sampler.

A sorbent sampling train utilizing Tenax was used to sample volatile organic compounds (VOC) other than vinyl chloride. Ambient air was drawn into a covered housing, and in succession through a prefilter, a Tenax cartridge, a rotameter, a leak-free diaphragm pump, and a dry gas meter. The sampling flow rate was approximately three liters per hour. This sampling train was equipped with a vacuum gage to allow air density correction to the rotameter calibration and an elapsed-time indicator to accurately record sampling time period. Concentrations were computed as previously described. Figure 4.2.1-5 is a schematic diagram of the Tenax sampling train.

A sorbent sampling train identical to the Tenax sampling train (except that the stainless steel cartridge was packed with Carbosphere instead of a Tenax cartridge) was utilized to sample vinyl chloride. The sampling flow rate was approximately three liters per hour. Figure 4.2.1-6 is a schematic diagram of the Carbosphere sampling train.

Asbestos was sampled using a 0.8-μm AA millipore filter. Ambient air was drawn into a covered housing, through the filter, a rotameter, a leak-free diaphragm pump, and a dry gas meter. The sampling flow rate was approximately 0.1 cubic meter per minute. This sampling train was equipped with a vacuum gage to allow air density correction to the rotameter calibration and an elapsed-time indicator to accurately record sampling time period. Figure 4.2.1-7 is a schematic diagram of the asbestos sampling train.

Figure 4.2.1-8 shows the field data sheet used to record all air sampler data. Table 4.2.1-1 is a list of parameters, chemical compounds, and metals for which the ambient air samples were analyzed. As specified in the Work Plan, 10 of the 31 sample sets collected were subjected to the complete analysis defined in Table 4.2.1-1. The criteria for the selection of the 10 sample sets and the results of their analysis are presented in Subsection 5.1.

Climatological data were also monitored continuously during the 31-day sampling period (noon, September 8, to noon, October 9, 1984). A Climatronics Mark III meteorological instrument for monitoring wind speed and direction was installed at the same location as the sampling instrumentation (Figure 4.2.1-1). Alignment of this instrument was checked daily. In addition to the site data, ambient temperature, barometric pressure, sky cover, precipitation, and wind speed and direction were obtained from National Weather Service Station WSO (Newark, New Jersey) which is located three miles southwest of the site.

4.2.2 Industrial Hygiene

The following industrial hygiene samples were taken during the field investigation:

- Atmospheric Samples for Dioxin - A total of 67 samples were taken including 24 blanks. These samples were primarily personnel samples to define potential employee exposure and required respiratory protection. Some samples were taken in general work areas to determine background levels at various locations during work activities. To define potential respiratory protection breakthrough, the sampling tubes were spiked with ^{37}Cl-2,3,7,8-TCDD prior to sample collection.

- Wipe Samples for Dioxin - A total of 14 wipe samples were taken, including three blanks. Most of these samples were taken to determine clean levels after equipment had been decontaminated. Four of the samples were taken in the employee decontamination area.

- Water Sample for Dioxin - A water sample was taken from an employee decontamination pan.

- Atmospheric Samples for Volatile Organics, Semivolatile Organics, and Alcohols - A total of 12 samples were taken with charcoal tubes, fluorisil tubes, and silica gel tubes to identify atmospheric contaminant on site. Analysis for these samples was by gas chromatograph/mass spectrometry.

- Atmospheric Samples for 2,4,5-T and 2,4-D - Because 2,4,5-T and 2,4-D are known to be present on site at high levels, six samples were taken to assess potential employee and area exposures.

- Atmospheric Samples for Asbestos - Four atmospheric asbestos samples were taken to determine employee exposure during sampling of asbestos materials.

- Atmospheric Samples for Sulfuric Acid - One area of the plant is known to have high concentrations of sulfuric acid. Two samples were taken to check for potential atmospheric concentrations.

- Heat Stress Measurements - Heat stress was measured continuously on days of concern to establish a work-rest regimen to help prevent heat stress related illnesses.

- Noise Measurements - Noise readings were taken at the drill rigs to determine if hearing protection was required.

- Drum and Tank Opening - Continuous air monitoring was performed with a combustible gas indicator and photoionization detector during all drum and tank opening. If levels exceeded established guidelines, the work was stopped until levels were reduced.

4.2.3 Buildings, Structures, and Equipment

4.2.3.1 Facilities Sampled and Methodology

A sampling program was performed on the buildings, structures, and equipment on the site for the purpose of determining the extent of dioxin contamination in or on each of these facilities. The buildings had different uses; therefore, the selection criteria for determining appropriate sample locations varied from building to building. A summary of the sampling program performed for buildings, structures, and equipment is provided in Table 4.2.3-1.

The on-site buildings include four primary structures (Figure 4.0-1). The chemical manufacturing building with a 190-foot stack is located in the northeast corner of the property. The three-story process building is located west of the chemical manufacturing building along the edge of the Passaic River. A large warehouse/maintenance shop sits in the center of the site and a two-story, cement-block laboratory/office building is located near the entrance on the southern portion of the site.

In addition to the major buildings, a small solvent shed is located near the southwest corner of the property and a small pumphouse is situated between the process and warehouse buildings. There are also 142 tanks and vessels located throughout the site. Some are inside the various major buildings; others are outside, alone, or grouped together in the raw material or final product tank farms.

Three different types of samples were obtained to determine the level of dioxin contamination. Wipe samples were taken from painted or smooth surfaces where potentially contaminated dust or particulate had accumulated. Chip samples were collected from brick- and concrete-type surfaces that are porous or uneven and thus not suitable for wipe samples. Bulk samples were collected whenever significant amounts of dirt or dust existed in the buildings or when sufficient quantities of unknown liquids, solids, or sludges were present in the tanks or process vessels.

To obtain wipe samples, a 50-centimeter square template (2,500 centimeters squared area) was placed on a wall, floor, vessel side wall, etc. The area within the template was wiped with a three-by-three-inch sterile cotton gauze pad soaked with hexane. Sampling was conducted by applying pressure to the pad in straight, even strokes moving from left to right (horizontal for walls) in the area designated. The wipe effort was then repeated from top to bottom (vertical for walls) at a 90-degree angle to the first wipe strokes. Upon completion of the wipe sampling, the pad was folded over and placed in the sample bottle.

Chip samples, collected from brick, concrete, ceramic tile, and asbestos panel surfaces, were taken using an electric impact hammer equipped with a serrated one-inch bit. Samples were collected by chipping a two-foot-long channel, two inches wide and one-quarter inch deep. Chipping bits were decontaminated after each use. The chip samples were collected in disposable aluminum pans and transferred to sample bottles. A camel hair brush and aluminum foil were used to collect the chipped material from floor samples.

Bulk samples were collected whenever a sufficient quantity of material was present. Hand trowels or brushes were used to collect solid materials and bottles or scoops were used to take samples of liquids or sludges.

4.2.3.2 Sample Locations

Laboratory/Office Building

Dioxin could be introduced into the office portion of the building as particulate material brought in on shoes and clothing from the process areas or as airborne material. Another possible source is the laboratory located in the same building. Once inside the building, dioxin would be distributed by normal traffic from room to room and possibly by the air conditioning system.

Samples from the interior of the laboratory/office building were taken from those areas with the highest potential for contamination. These areas include the employee change rooms, the laboratory rooms, the offices of the plant manager and plant engineer, the air conditioner intake, and the sink/wash area. In the laboratory, an exhaust hood and selected surfaces around benches or storage areas stained from chemical spills were wipe sampled. Small rooms such as closets and bathrooms and areas of lower potential contamination such as the accounting office were not sampled.

The most probable sources of contamination on the vertical exterior walls of the building would be airborne particulates, dust from vehicle movement, and splatter from rainfall on contaminated ground. Because the building exterior consists of cement block and brick which are porous, chip samples were taken from the brick and concrete block surfaces. Exterior samples were taken from ground level to two feet above, from three to five feet above ground, and from the roof sill to two feet below at the center of the west and north walls and the southeast corner of the east wall. An additional sample was taken from the walkway of the main entrance to the building. These locations should be indicative of contamination caused by dust from vehicular traffic or by personnel contact with materials in the nearby drum storage areas. Because the roof of the office building is flat, contamination may have resulted from airborne particulates and from the air discharge from the laboratory hoods. A wipe sample was taken from the west end of the roof for analysis.

The types and numbers of samples collected from the interior and exterior of the office building are summarized in Table 4.2.3.2-1. Plan layouts of the first and second floors of the building with room identification numbers are shown in Figures 4.2.3.2-1 and 4.2.3.2-2, respectively.

Warehouse

The warehouse could have been contaminated from drum leakage and spillage, airborne particulates, and the tracking in of material on equipment and personnel. The warehouse is a steel frame building with corrugated cement panels forming the exterior walls and roof. The panels appear to be of asbestos-cement composition. The building has a pitched metal roof, and the entire structure is supported by a steel wall frame with no interior supports. Office space is located in a concrete block structure within the warehouse frame. The southern portion of the warehouse was used as an equipment stockroom and maintenance shop.

The foreman's office and the lunchroom in the warehouse were sampled in the same manner as the laboratory/office building. Wipe samples were taken from coated concrete surfaces. Concrete floors in all areas of the warehouse were chip sampled. Wipe samples were also collected from the dust on light fixtures, beams, and window sills within the building.

A composite sample of both the interior and exterior surfaces of the walls was collected by chip sampling completely through the panels. Sample locations were from ground level to two feet above, three to five feet above ground, and from the roof to two feet below at the center of each of the four walls. Tape was applied over the chipped-out channels after sampling to prevent further degradation of the panels.

The metal roof of the building was wipe sampled at the center of the western end.

A summary of the type, number, and description of the samples taken from the warehouse is presented in Table 4.2.3.2-2. A layout of the warehouse with room identification numbers is provided in Figure 4.2.3.2-3.

Process and Chemical Manufacturing Buildings

The process and chemical manufacturing buildings are the structures with the highest potential levels of building contamination. The process building is a three-story steel frame structure with the same exterior panels as the warehouse. The chemical manufacturing building is a two-story brick structure. The interiors of both buildings contain various process vessels, equipment, and tanks.

Chip and wipe samples within the buildings were collected from concrete walls, floors, and columns near the process equipment. The sample locations were selected to represent the most likely areas of contamination such as the product packaging area and the acid conversion vessels. Bulk samples for dioxin analyses were collected from five locations in the process building. Sampling was conducted on all floors of both buildings.

Exterior samples from the building walls were taken in the same manner as the office/laboratory and warehouse buildings. The roof of the process building was wipe sampled in the northeast quadrant and the southwest corner. The roof of the chemical manufacturing building has collapsed into the structure, but two chip samples were collected from the top of the caved-in concrete slab.

A description of the samples collected from the process building and the chemical manufacturing building are provided in Tables 4.2.3.2-3 and 4.2.3.2-4, respectively.

Other Structures

The free-standing, 190-foot-high stack is adjacent to the southeast portion of the chemical manufacturing building. The stack is in poor structural condition, with small pieces of brick spalling from the outer surface. There are three openings in the stack. The lowest opening is a hinged manway at the base. A second opening is located where the flue enters the stack from the boiler, and the third is the top of the stack where smoke and gases exited. The two openings near the ground were sampled. A chip sample of soot was collected through the bottom manway. This sample should be a composite of material that has fallen from the interior of the stack since it was last in use. A chip sample was also taken from the interior of the flue pipe running from the boiler house to the stack. The exterior of the stack was sampled by taking a chip sample from ground level to two feet above.

The solvent shed and pumphouse were the remaining on-site structures to be sampled. A bulk sample was collected from the exterior of the solvent shed from the exterior panel. A chip sample from the interior concrete floor was also collected. Two chip samples were collected from the pumphouse. The interior sample was taken from the floor, and the exterior sample was taken from ground level to two feet above at the center of the north concrete block wall.

Equipment

A total of 142 tanks and process vessels are located on the site. The location of each tank and vessel is shown in Figures 4.2.3.2-4 through 4.2.3.2-6. Each tank or vessel was sampled with the exception of Tank 102, which has common piping connections with Tank 101, and Tank 105, which had no apparent access and appeared to be no more than a "wide spot" in the process piping.

Each tank was opened and inspected before sampling. Combustible gas and organic vapor levels were checked before sampling was initiated. If liquid, solid, or sludge residues were present in sufficient quantities, bulk samples were collected. If the vessels were empty, wipe samples were taken. No attempt was made to sample the interior of piping.

A total of 112 bulk samples and 28 wipe samples were collected from the tanks and vessels on the site.

Asbestos

The exteriors of several buildings are composed of what appears to be corrugated asbestos cement panels. Process and utility piping also appears to be covered with asbestos insulation. Bulk samples were collected from buildings and piping to establish the presence of asbestos. Insulation samples were collected by cutting a one-quarter-inch hole in the outer cover and collecting approximately one-half teaspoon of the insulating material. Bulk samples were also collected from building exterior corrugated panels. A total of 14 bulk samples were collected from the site--four from the office building, three from the warehouse, two from the chemical manufacturing building, three from the process building and two from process piping.

4.2.4 Sewers and Sumps

Four sewer and eight sump samples were collected from the site at the locations shown in Figure 4.2.4-1. Because existing plant drawings for the locations of these structures were limited, and the site was covered with geofabric, exterior sample locations were established with a metal detector. After a sump or sewer manhole cover was located, the geofabric was cut away. A visual inspection of the condition of the sump or sewer was made (i.e., depth of structure, presence of water, depth of sediment, etc.), and all information was recorded.

If the sump or sewer was dry, a sample was collected using a hand trowel and the material was placed in an aluminum pan. After sufficient material was collected for analytical testing, it was thoroughly mixed in the aluminum pan to produce a homogeneous sample and placed in sample bottles. At locations where the structure was too deep for collecting a sample by hand or where it contained water, a long-handled, perforated scoop was used for sample collection. Excess water was allowed to drain from the sample before it was placed in the aluminum pan for mixing and placing in sample bottles.

Data pertaining to sampling procedures, physical description of samples, amount collected, sample locations, etc., were recorded in the field log notebook. All sampling equipment, including trowels, gloves, pans, and scoops, was returned to the decontamination line for cleaning after the collection of each sample.

4.2.5 Soils

Soil samples were obtained from 14 drilled borings on or near the site (Boring B-14 was drilled on the Sherwin-Williams property approximately 100 feet south of the site boundary). Additional near-surface soil samples were obtained from 19 hand auger borings on the site. Refusal occurred at six of the near-surface locations and sampling was completed at these locations with a drill rig. The locations of all drilled borings and near-surface samples are shown in plan in Figure 4.2.5-1. Locations of the sampling points relative to the site coordinate system and ground surface elevations relative to the site datum are provided in Table 4.2.5-1. Descriptions of sampling techniques are provided in the following subsections.

4.2.5.1 Drilled Borings

4.2.5.1.1 Drilling Procedures

Fourteen borings were drilled at the locations shown in Figure 4.2.5-1. At each location, the boring was advanced through the surficial fill material with a 12-inch O.D., 6-inch I.D. hollow-stem auger. Continuous samples of fill material were collected ahead of the auger by two- and three-inch O.D. split-spoon samplers driven in two-foot increments using a 140-pound hammer with a 30-inch vertical drop.

The drilling progressed with the taking of samples and subsequent advancement of the auger to the bottom of the previous sampling interval until the bottom of the fill was reached. If a boring was to be advanced below the fill to the underlying silt and/or alluvial sands, an eight-inch PVC casing was set to the contact elevation between the fill and underlying stratum. This casing was tremie grouted to the surface with a cement grout. The grout was mixed in the following proportions: one 94-pound bag of Type I portland cement; 5.2 gallons of fresh water; and approximately one ounce of aluminum hydroxide. The grouted casing was allowed to set until the next shift to attain partial strength before drilling operations continued. After the grout set, it was drilled out using an eight-inch roller bit and recycled drill water. Then sampling in the underlying silt layer was initiated.

The silt layer was sampled by continuous, undisturbed Shelby tube samples. Each Shelby tube was hydraulically pushed into the silt a maximum distance of two feet, allowed to stabilize in the borehole for 15 minutes, and then removed. After removal of the Shelby tube, the boring was advanced to the bottom depth of the previous Shelby tube sample with a four-inch roller bit and recirculating wash water. This drilling procedure was continued until the bottom of the silt layer was encountered. If sampling was to be performed below the silt layer, a four-inch PVC casing was installed to the depth of the silt/alluvial sand contact and tremie grouted to the ground surface. The casing was left undisturbed for at least 24 hours to allow proper curing of the grout mixture.

Sampling in the alluvial sands consisted of obtaining standard split-spoon samples at five-foot intervals and advancing the boring using rotary methods with water or drilling mud and a nominal four-inch roller bit (actual size was 3.75 inches). If field conditions warranted, a temporary steel casing was set in the boring to prevent caving of the borehole during drilling operations.

At the completion of a boring to its specified depth. The boring was tremie grouted to the surface using cement grout as the temporary steel casing was removed. All water forced to the surface during the grouting procedure was collected and stored on site.

4.2.5.1.2 Sample Collection Procedures

At each boring location, the first sample was taken from depths of zero to six inches using a hand trowel. The sample was placed in an aluminum pan and thoroughly mixed in accordance with NJDEP protocol before placement into sample bottles. All subsequent samples were taken with a split-spoon sampler or Shelby tube, depending on the type of material encountered. After removal from the borehole, the split-spoon sampler was opened and placed on clean paper on a portable workbench. A photograph was taken of the sample with appropriate identification indicated to provide a permanent record of sample condition at the time of collection. A physical description of each sample was recorded in the field log notebook and on the field boring log by the site geologist. The various soil strata in each boring were described using both the Burmister and the Unified Soil Classification Systems.

After removal from the borehole, Shelby tubes were examined and data such as length of sample recovered and type of material were recorded. Each end of the Shelby tube was sealed with melted wax and covered with a plastic end piece. The end piece was taped and then sealed with more melted wax to provide an airtight seal. Each Shelby tube was marked with a sample label and permanent marker before being transported to the decontamination line under Chain-of-Custody procedures.

After each sample was obtained, all equipment used in the sampling process, including split-spoon samplers, trowels, and pans was sent to the decontamination line for cleaning prior to reuse. Shelby tubes were decontaminated and wrapped in plastic before being used for sampling. All augers and drill bits were decontaminated after the completion of sampling at a particular boring location before proceeding to the next boring location.

Samples for chemical analysis were collected according to the following schedule:

DEPTH	ANALYSIS AND SAMPLE CONTAINER
0 - 6 inches	Full priority pollutants and dioxin; three 500-ml jars
6 - 12 inches	Dioxin; one 250-ml jar
12 - 24 inches	Full priority pollutants and dioxin; three 500-ml jars
24 inches below the surface to 18 inches above the bottom of fill	Selected dioxin; one 250-ml jar
18 inches above the bottom of fill to 6 inches above bottom of fill	Full priority pollutants; three 500-ml jars
6 inches above bottom of fill to the bottom of the fill	Dioxin; one 250-ml jar

Samples of 250 milliliters were taken from the top and bottom of each Shelby tube and composited. The second Shelby tube sample from the silt layer in each boring was analyzed for dioxin. When a dioxin level greater than one part per billion (ppb) was observed, selected Shelby tube samples from the same boring were also tested for dioxin (remaining tubes were archived).

4.2.5.2 Near-Surface Soil Sampling

Near-surface soil sampling locations were chosen using a biased approach based on plant activities and functional units. Sample location points are shown in Figure 4.2.5-1. Samples were obtained from depths of zero to 6 inches, 6 to 12 inches, and 12 to 24 inches at each location, with additional samples collected from 24 to 36, 36 to 48, and 48 to 60 inches wherever possible. Each near-surface soil sampling location was identified by its grid coordinate system location, as previously described.

Thirteen sample locations were chosen at points exterior to the site buildings and six sample locations were selected inside the existing buildings. A total of 39 soil samples were collected from the exterior locations from depths of zero to 24 inches (zero to 6 inches, 6 to 12 inches, and 12 to 24 inches). All of these samples were analyzed for dioxin and 26 were analyzed for priority pollutant parameters. Eighteen samples were collected from the same depth interval beneath the existing buildings; all of these samples were analyzed for dioxin and 12 samples were analyzed for priority pollutant parameters. (Note that depths for the samples under buildings were measured from the bottom of concrete floor slabs.) For all 19 near-surface soil sampling locations, an additional 46 samples were collected from the depth interval of 24 to 60 inches to be archived for possible analyses at a later time.

Borings B-10 and B-11 which were drilled to determine the depth of the silt layer were also designated as near-surface soil locations. Near-surface soil location G-5-E corresponds to Boring B-10 and F-5-E corresponds to Boring B-11. All near-surface soil sample and boring locations are shown in Figure 4.2.5-1.

Slight modifications were made to sampling locations based on accessibility and materials encountered at a particular location. Changes were noted in the field sampling log and measurements taken to accurately locate sampling points.

In exterior areas, access was gained by either removing the geofabric cover from the sample point or by cutting an approximately two-foot-square hole in the geofabric cover. In the interiors of buildings and any outside area covered by asphalt or concrete pavement, penetration was made using a portable coring machine. An eight-inch-diameter, thin-walled diamond core bit was used to drill through the concrete or asphalt.

Samples collected from zero to 6 inches and 6 to 12 inches were obtained using a hand trowel or by hand. Material collected from the entire sampling interval was placed in an aluminum mixing pan and thoroughly composited before being placed into sample bottles. Samples were placed in either 250- or 500-milliliter amber sampling bottles depending on the analysis to be performed.

After completion of sampling from the upper 12 inches in unconsolidated materials, the hole was cased with an eight-inch PVC pipe. The eight-inch casing was grouted in the hole with a quick-drying hydraulic cement to anchor it and prevent cross contamination of the lower sampling increment from materials sloughing down the outside.

Samples collected from 12 to 24 inches were obtained with a post-hole digger, hand auger, hand trowel, or by hand. At some locations where brick or concrete debris was encountered, a steel digging bar was used to break up or loosen the material to be sampled. Material collected from the entire sample length was placed in an aluminum mixing pan and composited. Upon completion of sampling to 24 inches, a four-inch PVC casing was installed with either cement grout or quick-drying hydraulic cement before additional samples were collected. At locations where cement grout was used, the grout was allowed to cure for at least 24 hours before additional samples were collected.

If a sampling location was in an area covered by concrete or asphalt, an eight-inch PVC casing was installed from the top of the slab to a depth 12 inches below. Grout was not necessary to hold this casing in place. After obtaining the sample from 12 to 24 inches, a four-inch PVC casing was installed using a neat concrete grout. The grout was allowed to cure for a minimum of 24 hours before additional samples were obtained.

At all locations, an attempt was made to collect additional samples from 24 to 60 inches at 12-inch intervals. The samples were collected with a three-inch stainless steel bucket auger. The auger was carefully placed into the hole to reduce the potential for contact with the material in the upper zone and removed with equal care. Soil material collected in the bucket auger was placed in an aluminum pan and mixed before samples were placed into a container. At least two auger increments were used for each sample and all sampling tools and pans were decontaminated between samples.

If refusal occurred during the course of advancing the hole, an attempt was made to break through the obstruction with a steel digging bar. Refusal occurred at six locations, and at these locations, a drill rig was used to advance the holes to their design depth. Drilling was accomplished with 12-inch-diameter hollow-stem augers, and continuous split-spoon samples were obtained in advance of the augers. After completion of the sampling process, all holes were immediately grouted to the surface with cement grout.

4.2.6 Ground Water

Eight shallow monitoring wells and one piezometer were installed on site to evaluate the hydrogeologic regime and nature of contaminants present in the ground water. One shallow and one intermediate depth monitoring well were also installed off site. All shallow wells (designated as "A") were completed in the surface fill above the organic silt layer after completion of an adjacent soil investigation boring. The intermediate monitoring well (designated as "B") was installed near the shallow off-site well and was screened in the alluvial sand beneath the silt stratum at a depth of approximately 35 feet. Locations of the eight on-site monitoring wells, the piezometer, and the off-site wells are shown in Figure 4.2.6-1.

4.2.6.1 Well Installation

Shallow Monitoring Wells

Shallow monitoring wells were located within 10 feet of the corresponding soil boring. The well boreholes were advanced with 12-inch hollow-stem augers to the top of the silt layer. A schematic diagram of a typical shallow monitoring well is shown in Figure 4.2.6.1-1.

For the shallow monitoring wells, Schedule 40, flush coupled and jointed, two-inch-diameter PVC casing with unglued slip caps on both the top and the bottom of the casing was used The screen was generally 5 to less than 10 feet (as per NJDEP screening requirements) of No. 10 slot (0.010-inch) two-inch-diameter Schedule 40 PVC. The top of the screen was located approximately one foot above the static water table. The filter pack consisted of clean bagged sand approved by NJDEP for use on site.

A layer of bentonite pellets (0.2 to 0.5 foot thick) was placed at the top of the gravel pack to prevent penetration of the gravel pack by the grout. This layer was tamped after placement to provide an effective seal. The remainder of the annular space was filled with cement grout to minimize surface infiltration. All monitoring wells were grouted prior to the end of a shift, and a six-inch diameter protective steel outer casing was installed following the completion of each well. A protective concrete collar 1-1/2 feet square and a minimum of one foot thick was constructed at or near the ground surface around the protective casing.

Intermediate Monitoring Well

An intermediate depth monitoring well was located approximately 100 feet south of the site, as shown in Figure 4.2.6-1. The well was screened in the alluvial sand which underlies the silt at the site. To reduce the potential for surface contaminants being introduced into the alluvial sands, the following installation procedure was used. A schematic drawing of the intermediate monitoring well is provided in Figure 4.2.6.1-2.

A fourteen-inch diameter hole was advanced to the top of the silt layer with hollow-stem augers. Immediately upon contact with the silt, drilling was halted and the boring was filled with cement grout. A two-foot head of grout was maintained within the augers as they were withdrawn to maintain the boring diameter. After the augers were completely withdrawn and the boring was grouted to the surface, a length of 10-inch-diameter PVC casing was pushed from the surface to the top of the silt. This grout was allowed to set overnight to attain partial strength.

At the beginning of the next shift, the grout was drilled out of the PVC casing using a wet rotary technique and clean water as the drilling fluid. The diameter of this hole was approximately eight inches and extended to the bottom of the silt layer. Continuous Shelby tube samples were advanced through the silt for geotechnical analysis, and samples for dioxin analysis were obtained. At the bottom of the silt layer, drilling was halted and a six-inch, flush-joint, PVC casing set to the bottom of the boring. The space between the 10-inch casing and the six-inch casing was filled with grout to the ground surface. The grout was allowed to set overnight.

An approximately six-inch-diameter boring was advanced to a depth of approximately 35 feet using a mud rotary technique and split-spoon samples were obtained at five-foot intervals. A Schedule 40, flush-coupled and threaded, two-inch-diameter PVC casing with well screen was installed. The well was screened at an approximate depth interval of 25 to 35 feet with two-inch-diameter, No. 10 slot, PVC screen. The bottom of the screen was sealed with an unglued slip cap. No filter pack was introduced. The natural formation was allowed to collapse against the screen as the casing was withdrawn. A tremie pipe was set in the annular space outside of the casing to the bottom of the silt and grout was introduced, flushing the mud out as the well was grouted to the surface.

4.2.6.2 Well Development

Following installation of the well, development was performed to remove materials introduced into the screened soil strata during drilling. All wells were developed for a minimum period of one hour or until a turbidity-free discharge was obtained. Surging was also employed for wells installed in the upper fine-grained fill materials. Well development was performed at least two days after well completion to minimize the potential for drawing uncured grout into the filter pack of the well. All water resulting from well development was collected and stored on site.

4.2.6.3 Water Level Monitoring

Ground water level measurements were taken in the eight perimeter monitoring wells at approximately 40-minute intervals for a 12-hour period on October 15, 1984. At the same time, tidal measurements were taken at the staff gage located on the river close to monitoring well MW-2A. The staff gage measurements were taken to ensure that a complete tidal cycle was covered. Continuous-reading water level recorders were installed in monitoring wells MW-1A and MW-7A to evalute the hydraulic connection between the Passaic River and the water-bearing zones beneath the site.

4.2.6.4 Ground Water Sampling

Following the installation and development of the monitoring wells, ground water sampling was conducted on October 9 and October 30, 1984, to assess the extent of ground water contamination. Each set of ground water samples consisted of one sample from each well. The procedure for obtaining ground water samples is described in the following paragraphs.

Prior to evacuation, the static ground water level was measured in each monitoring well. Each well was then evacuated by bailing to remove potentially stagnant water from the screened zone. The wells were bailed until at least three well volumes had been removed or until they were bailed dry. Ground water samples were collected using the same teflon or stainless steel bailers used to evacuate the well. One bailer was dedicated to each ground water monitoring well. Each bailer was cleaned at the Middlebrook Pike laboratory prior to initial use and between subsequent uses.

Because of the anticipated influence of tidal fluctuations on the water-bearing zones beneath the site, ground water sampling was performed during periods of receding tide to obtain consistent and representative ground water samples. Ground water samples were obtained within two hours after evacuation had been completed and within the proper tidal cycle. If recovery of a well after evacuation was not sufficent for sampling within the proper tidal cycle, samples were obtained as soon as an adequate volume of water was observed in the well, but no later than 24 hours after evacuation.

All containers were prepared in accordance with the project sample handling procedures before arrival on the site. The first volume of water obtained from a monitoring well after evacuation was used to fill two 40-ml glass septum vials for volatile organics analysis. The rest of the first volume was used to fill the remaining sample containers. These samples were placed in glass containers with teflon-lined lids, with no air bubbles permitted in the head space. Specific conductance, salinity, temperature, and pH of each ground water sample was measured and recorded in the field. Ground water samples were transferred to the decontamination line in coolers and tracked under the project Chain-of-Custody protocol.

4.2.6.5 Slug Tests

Slug tests were conducted in monitoring wells MW-1A through MW-8A on November 19 and 20, 1984, to estimate the hydraulic conductivity (permeability) of the zones screened by each well. The test consisted of measuring the rate at which the water level in the monitoring well declined after a known volume (slug) was rapidly introduced and the rate at which the water level rose after the slug was rapidly removed. Two slugs were used at the site--a three-foot-long PVC slug in monitoring wells MW-3A through MW-8A and a four-foot-long solid steel slug in monitoring wells MW-1A and MW-2A. The volumes of the slugs were small compared to the volume of water in the aquifer; thus, the test provided an estimate of hydraulic conductivity within only a few feet radius of each monitoring well. An ENVIROLABS Model DL-120-MCP Data-Logger with a submersible pressure transducer was used to record water level changes.

The slug was quickly, but smoothly, lowered into the well until immersed. The water level initially rose as the slug was immersed and then fell to reach equilibrium with the aquifer water level. With the exception of monitoring wells MW-2A and MW-6A, the resulting falling water level was recorded on the strip chart until the water level returned to its pre-immersion static level. Then the slug was quickly and smoothly removed from the well. The resulting rise in water level was recorded on the strip chart. When the water level returned to static level, the test was considered complete.

4.2.7 Passaic River Water

4.2.7.1 River Level Monitoring

A staff gage (Figure 4.2.7.1-1) was installed in the Passaic River adjacent to the site near monitoring well MW-2A, and the tidal fluctuations in the river level were measured through a full tidal cycle on two occasions. The observed levels were referenced to the site datum. Results of these measurements on October 15, 1984, were compared to levels in the site monitoring wells. The river level was also observed before and during monitoring well sampling to confirm field fluctuations.

4.2.7.2 River Water Sampling

Samples were obtained from the Passaic River on October 9 and 30, 1984, in conjunction with the site monitoring well sampling program. The sample obtained on October 9 was from a location upstream from the site at the Jackson Bridge bulkhead. A decontaminated stainless steel bucket was rinsed in river water and the water samples were then collected and placed in glass bottles.

The sample collected on October 30, 1984, was collected from a boat in the Passaic River adjacent to the site. A decontaminated sampler was rinsed with river water, and a sample was collected from two feet below the water surface to avoid excess surface scum and debris. The water was then placed in sample bottles following the same procedures used for monitoring well sample collection.

4.2.8 Passaic River Sediment

Dioxin concentrations had previously been found in 35 river sediment grab samples taken by the NJDEP and the EPA. Fifteen of the 35 samples were collected from five transects across the Passaic River. Based upon a review of the analytical results from these samples, a supplementary sampling program of the river was developed.

As part of the present study, sediment samples were collected from a 4,800-foot distance along the south bank of the Passaic River. Beginning at a point located at the approximate center of the site, sample locations were measured at 200-foot intervals in the upstream and downstream directions. Additional samples were collected at 400-foot intervals to a distance of 2,400 feet upstream and downstream. Three additional transects were located at the west property line corner of the site, 300 feet upstream from this transect, and 100 feet downstream from the east property line. Figure 4.2.1-8 indicates the locations of the samples.

Samples were taken from three locations along each of the three transects. These locations were the north bank, center, and south bank of the Passaic River. The samples collected from the transect locations were from depth intervals of zero to 12 inches and 12 to 24 inches. Samples from zero to 12 inches were obtained from the remaining 14 sample locations, and four of the remaining locations on the south bank were sampled from 12 to 24 inches.

River sediment samples were collected by advancing Shelby tubes to the prescribed sampling depth and recovering a sediment core sample. The sample was extruded into a clean aluminum pan and the edges scraped with a stainless steel spoon to minimize cross contamination. Only the central core of the sediment sample was transferred to a sample bottle for chemical analysis. If samples were required from two depths (zero to 12 inches and 12 to 24 inches), the sediment column from each interval was extruded into a clean aluminum pan. All sampling equipment was decontaminated between sample collections.

Following the completion of the surface sediment sampling, a deep core sediment sample was taken at Station 1-3-0. A PVC casing was pushed into the sediment to a depth of 40 inches. The sediments were compressed by the casing, however, and only six inches of material were recovered. The remaining core samples were obtained using a piston sampler, which was decontaminated between samples. Sample increment depths were: 40 to 46 inches, 46 to 52 inches, 60 to 66 inches, and 66 to 72 inches.

4.2.9 Background Soils

One of the 14 soil borings (B-14) was completed off site on the Sherwin Williams property approximately 100 feet south of the site boundary (Figure 4.2.5-1). The boring was advanced through the surface fill and underlying silt to the uppermost portion of the alluvial sand using the same drilling methods as for the on-site soil borings. Soil samples were obtained and described in the same manner as samples collected in on-site soil borings.

Three locations in the City of Newark, within a 10-mile radius of the site, were selected for background near-surface soil sampling. The sampling points are located near Harrison Avenue, Raymond Boulevard, and Roanoke Avenue, as shown in Figure 4.2.9-1.

Five samples were collected using a hand trowel from a surface area approximately three feet by three feet. Four were taken from the corners of the square and one from the center. Each sample was approximately four inches in diameter and six inches deep, and was placed in a disposable aluminum pan. The five samples were then composited into a single sample in the pan and transferred to the sample bottle. The sampling operation was observed by representatives of the NJDEP.

4.2.10 Drum Sampling

A total of 570, 55-gallon drums are currently stored on the site. The drum contents were removed from various pieces of equipment and vessels on the site in 1981. Liquids were drained into bung-type drums, solids and sludges were placed in open-head drums. A total of 469 drums were stored on the first and second floors of the chemical manufacturing building and 101 drums were stored on the second floor of the processing building. Locations of all of the drums are shown in Figures 4.2.10-1 through 4.2.10-4.

Sampling of the drums was conducted by a four-man crew consisting of a foreman and three technicians. The foreman supervised and recorded data in the field log notebook. Self-contained breathing apparatus was worn by Technicians 1 and 2 during the drum opening and sampling activities; the foreman and Technician 3 wore full-faced respirators. Technician 1 wore a heavy PVC suit; the other members of the sampling team wore polyethylene-coated tyvek suits. Technician 1 opened the drums and sealed them after sampling, and performed air monitoring for organic vapors and conbustible gases during drum sampling. Technician 2 sampled the drums and performed air monitoring during opening and sealing of the drum. Technician 3 changed air cylinders for the breathing apparatus, returned the samples to the laboratory trailer, and stenciled the drums.

All drums were sampled on a "where-is" basis with only minimal movement to permit access to the drum. Prior to and during drum opening activities, monitoring was conducted using a HNU/PID organic vapor detector and a Gastex 3 (GX-3) combustible gas indicator.

The bungs or open heads were removed using nonsparking tools. Only one drum at a time was opened to minimize the release of any combustible or organic vapor. Glass sampling rods (approximately 3 feet by 13 millimeters) were used to sample liquids. The rods were inserted to the bottom of the drum, the exposed end of the glass rod was plugged, and the sample was transferred to the sample bottle. The rod was then disposed of in the drum and the drum was resealed. Electrical conduit was used in a manner similar to that described above to sample drums containing friable or crystallized material. Drums containing extremely hard or solid material were sampled using a stainless steel boring tool. The tool was decontaminated after each use.

Sampling data recorded in the field log notebook by the foreman included date, time, type of drum, description of the sample, percent LEL reading, and the organic vapor level reading in parts per million.

Three drums could not be opened using standard drum opening tools. A remote drum opener with a hydraulic ram was used to puncture these drums. After the drum was sampled, it was sealed with a liquid-tight patch.

Each drum was stenciled with a sequential number (1 through 570) after it was sampled. The exact location of each numbered drum was then logged on a drawing.

TABLES

TABLE 4.1.3.2-1
SAMPLE PACKAGING REQUIREMENTS

HAZARDOUS (POISON B PACKAGING)	NONHAZARDOUS (CONVENTIONAL PACKAGING, PRESERVATION IN ICE CHESTS)
Site Soils (near-surface and borings)	Site Waters
Wipes	Industrial Hygiene
Drums	Ambient Air
Tanks	River Sediments

TABLE 4.1.3.2-2

SAMPLE PRESERVATION REQUIREMENTS

PARAMETER	TECHNIQUE SOIL	 WATER
Dioxin	None	None
Organic PP	Cool, 4°C(1)	Cool, 4°C(1)
Metals	None	2 ml conc. HNO_3(2) (to pH <2)
Cyanide	None	2 ml conc. NaOH(2) (to pH >12)
Phenols	None	2 ml conc. H_2SO_4(2) (to pH <2)

(1) When possible, with packaging restrictions.

(2) Added to sample bottles prior to collection; these containers must not be rinsed prior to being filled with sample.

TABLE 4.1.3.5-1

ROUTINE QUALITY CONTROL SAMPLES AND LABORATORY CHECK FREQUENCIES

	FIELD BLANKS	TRIP BLANKS	ON-SITE SPLITS WITH NJDEP	METHOD BLANKS	BLIND SPLITS	SAMPLE OR BLANK SPIKES	INTERNAL SURROGATE STANDARDS	REFERENCE (CALIBRATION STANDARDS)
DIOXIN								
Wipes	5	5	-	5	-	5	100	1/shift
Soil/Sediment/Sludge	-	-	5	5	5	5	100	1/shift
Water	5	5	5	5	5	5	100	1/shift
Chips	-	-	5	5	5	5	100	1/shift
VOLATILES								
Soil/Sediment/Sludge	5	5	5	5	5	5	100	1/shift
Water	5	5	5	5	5	5	100	1/shift
SEMI-VOLATILES								
Soil/Sediment/Sludge	-	-	5	5	5	5	100	1/shift
Water	5	5	5	5	5	5	100	1/shift
PP METALS								
Soil/Sediment/Sludge	-	-	5	5	5	5	-	1/shift
Water	5	5	5	5	5	5	-	1/shift
CYANIDE								
Soil/Sediment/Sludge	-	-	5	5	5	5	-	1/shift
Water	5	5	5	5	5	5	-	1/shift
TOTAL PHENOLS								
Soil/Sediment/Sludge	-	-	5	5	5	5	-	1/shift
Water	5	5	5	5	5	5	-	1/shift

Note: All numbers are percentages.

TABLE 4.1.4-1

ANALYSIS PARAMETERS VERSUS SAMPLE MATRICES

ANALYTICAL PARAMETERS	NUMBER OF PARAMETERS OR ANALYTES/ ANALYTICAL METHOD	SAMPLE TYPE	SOIL	RIVER SEDI-MENTS	SEWER SLUDGES	WELL BORINGS (SOIL)	AIR	WELL WATER	DRUMS	WIPES	CHIPS	SCRAPES	RINSATE WATER	BULK	INDUS-TRIAL HYGIENE
2,3,7,8-TCDD	(1)		X	X	X	X	X	X	X	X	X	X	X		X
2,3,7,8-TCDF[a]	(1)		X	X		X									
Octachlorodioxin[a]	(1)		X	X		X									
Priority Pollutant Acid Base/Neutrals (Ac/B/N)	(69)		X	X		X		X					X		
Priority Pollutant Pesticides	(25)		X	X		X		X					X		
Priority Pollutant Metals	(13)		X	X		X		X					X		
Priority Pollutants Volatile Organic Compounds (VOC)	(38)		X	X		X		X					X		
Herbicides	(10)		X	X		X		X					X		
Polycyclic Aromatic Hydrocarbons (PAH)	(25)						X								
Ambient Air Volatile Organic Compounds	(24)						X								
Asbestos	(1)						X					X		X	X
Ambient Air Metals	(8)						X								
Inhalable Particulate	(1)						X								
Total Suspended Solids	(1)						X								
Vinyl Chloride	(1)						X								
Pesticides and Other Chlorinated Organics	(?)						X								
Hazardous Waste Characterization	-								X						
Cyanides	(1)		X	X		X		X					X		
Phenols	(1)		X	X		X		X					X		
Others															X

---

[a] 10 percent of total samples collected.

TABLE 4.1.4-2

LISTING OF ANALYTES

CAS NUMBER	COMPOUND NAME
DIOXIN	
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin
	2,3,7,8-Tetrachlorodibenzofuran
3268-87-9	Octachlorodibenzo-p-dioxin
PRIORITY POLLUTANT	
Volatile Organic Compounds	
71-43-2	Benzene
56-23-5	Carbon tetrachloride
108-90-7	Chlorobenzene
107-06-2	1,2-Dichloroethane
71-55-6	1,1,1-Trichloroethane
75-34-3	1,1-Dichloroethane
79-00-5	1,1,2-Trichloroethane
79-34-5	1,1,2,2-Tetrachloroethane
75-00-3	Chloroethane
542-88-1	Bis(chloromethyl) ether
110-75-8	2-Chloroethylvinyl ether
67-66-3	Chloroform
75-35-4	1,1-Dichloroethene
156-60-5	trans-1,2-Dichloroethene
78-87-5	1,2-Dichloropropane
10061-02-6	trans-1,3-Dichloro-propene
10061-01-5	cis-1,3-Dichloro-propene
100-41-4	Ethylbenzene
75-09-2	Methylene chloride
74-87-3	Chloromethane
74-83-9	Bromomethane
75-25-2	Bromoform
75-27-4	Bromodichloromethane
75-69-4	Trichlorofluoromethane
75-71-8	Dichlorodifluoromethane
124-48-1	Chlorodibromomethane
127-18-4	Tetrachloroethene
108-88-3	Toluene
79-01-6	Trichloroethene
75-01-4	Vinyl chloride

TABLE 4.1.4-2
(Continued)

CAS NUMBER	COMPOUND NAME
67-64-1	Acetone
78-93-3	2-Butanone
75-15-0	Carbon disulfide
519-78-6	2-Hexanone
108-10-1	4-Methyl-2-pentanone
100-42-5	Styrene
108-05-4	Vinyl acetate
95-47-6	Total Xylenes

PRIORITY POLLUTANT

Base/Neutral and Acid Organic Compounds

CAS NUMBER	COMPOUND NAME
88-06-2	2,4,6-Trichlorophenol
59-50-7	4-Chloro-3-methyl-phenol
95-57-8	2-Chlorophenol
120-33-2	2,4-Dichlorophenol
105-67-9	2,4-Dimethylphenol
88-75-5	2-Nitrophenol
100-02-7	4-Nitrophenol
51-28-5	2,4-Dinitrophenol
534-52-1	4,6-Dinitro-2-methylphenol
87-86-5	Pentachlorophenol
108-95-2	Phenol
65-85-0	Benzoic acid
95-48-7	2-Methylphenol
108-39-4	4-Methylphenol
95-95-4	2,4,5-Trichlorophenol
83-32-9	Acenaphthene
92-87-5	Benzidine
120-82-1	1,2,4-Trichlorobenzene
118-74-1	Hexachlorobenzene
67-72-1	Hexachlorethane
111-44-4	Bix(2-chloroethyl)ether
91-58-7	2-Chloronaphthalene
95-50-1	1,2-Dichlorobenzene
541-73-1	1,3-Dichlorobenzene
106-46-7	1,4-Dichlorobenzene
91-94-1	3,3'-Dichlorobenzidine
121-14-2	2,4-Dinitrotoluene
606-20-2	2,6-Dinitrotoluene
122-66-7	1,2-Diphenylhydrazine
206-44-0	Fluoranthene
7005-72-3	4-Chlorophenyl phenyl ether
101-55-3	4-Bromophenyl phenly ether
39638-32-9	Bis(2-chloroisopropyl)ether
111-91-1	Bis(2-chloroethoxy)methane
87-68-3	Hexachlorobutadiene
77-47-4	Hexachlorocyclopentadiene
78-59-1	Isophorone

TABLE 4.1.4-2
(Continued)

CAS NUMBER	COMPOUND NAME
91-20-3	Naphthalene
98-95-3	Nitrobenzene
62-75-9	N-nitrosodimethylamine
86-30-6	N-nitrosidiphenylamine
621-64-7	N-nitrosodipropylamine
117-81-7	Bis(2-3thylhexyl)phthalate
85-68-7	Butyl benzyl phthalate
84-74-2	Di-N-butyl phthalate
117-84-0	Di-N-octyl phthalate
84-66-2	Diethyl phthalate
131-11-3	Dimethyl phthalate
56-55-3	Benzo(A)anthracene
50-32-8	Benzo(A)pyrene
205-99-2	Benzo(B)fluoranthene
207-08-9	Benzo(K)fluoranthene
218-01-9	Chrysene
208-96-8	Acenaphthylene
120-12-7	Anthracene
191-24-2	Benzo(GHI)perylene
86-73-7	Fluorene
85-01-0	Phenanthrene
53-70-3	Dibenzo(A,H) anthracene
193-39-5	Indeno(1,2,3-CD)pyrene
129-00-0	Pyrene
62-53-3	Aniline
100-51-6	Benzyl alcohol
106-47-8	4-Chloroaniline
132-64-9	Dibenzofuran
91-57-6	2-Methylnaphthalene
88-74-4	2-Nitroaniline
99-09-2	3-Nitroaniline
100-01-6	4-Nitroaniline

PRIORITY POLLUTANT

Pesticides and PCBs

309-00-2	Aldrin
60-57-1	Dieldrin
57-74-9	Chlordane
50-29-3	4,4'-DDT
72-55-9	4,4'-DDE
72-54-8	4,4'-DDD
959-98-8	alpha-Endosulfan
33213-65-9	beta-Endosulfan
1031-07-8	Endosulfan sulfate
72-20-8	Endrin
7421-93-4	Endrin aldehyde
76-44-8	Heptachlor
1024-57-3	Heptachlor epoxide

TABLE 4.1.4-2
(Continued)

CAS NUMBER	COMPOUND NAME
319-84-6	alpha-BHC
319-85-7	beta-BHC
58-89-9	gamma-BHC
319-86-8	delta-BHC
53469-21-9	PCB-1242
11097-69-1	PCB-1254
11104-28-2	PCB-1221
11141-16-5	PCB-1232
12672-29-6	PCB-1248
11096-82-5	PCB-1260
12674-11-2	PCB-1016
8001-35-2	Toxaphene

PRIORITY POLLUTANT

Chlorinated Herbicides

CAS NUMBER	COMPOUND NAME
75-99-0	Dalapon (Dowpon)
1918-00-9	Dicamba
7085-19-0	MCPP
94-74-6	MCPA
120-36-5	Dichloroprop (2,4-DP)
94-75-7	2,4-D
93-72-1	2,4,5-TP (Silvex)
93-76-5	2,4,5-T
94-82-6	2,4-DB
88-85-7	Dinoseb (DNBP)

PRIORITY POLLUTANT

Metals

CAS NUMBER	COMPOUND NAME
	Antimony
	Arsenic
	Beryllium
	Cadmium
	Chromium
	Copper
	Lead
	Mercury
	Nickel
	Selenium
	Silver
	Thallium
	Zinc

TABLE 4.1.4-2
(Continued)

CAS NUMBER	COMPOUND NAME
Classical Parameters	
	Total Cyanide
	Total Phenols
	Asbestos
AMBIENT AIR	
Metals	
	Lead
	Manganese
	Copper
	Vanadium
	Cadmium
	Zinc
	Iron
	Nickel
AMBIENT AIR	
Volatile Organic Compounds (VOCs)	
	Vinyl chloride
	Vinylidene chloride
	Methylene chloride (ME chloride)
	Chloroform
	1,2-Dichloroethane
	Benzene
	Carbon tetrachloride
	Trichloroethylene (TRIC)
	1,4-Dioxane
	1,1,2-Trichloroethane
	toluene
	1,2-Dibromethane
	Tetrachloroethylene (PERC)
	Chlorobenzene
	Ethylbenzene
	x-Xylene
	p-Xylene
	Styrene
	o-Xylene
	1,1,2,2-Tetrachloroethane
	o-Chlorotoluene
	p-Chlorotoluene
	p-Dichlorobenzene
	o-Dichlorobenzene
	Nitrobenzene

TABLE 4.1.4-2
(Continued)

CAS NUMBER	COMPOUND NAME
AMBIENT AIR Polycyclic Aromatic Hydrocarbons (PAHs)	
	Benzo(k)fluoranthene
	Benzo(a)pyrene
	Benzo(ghi)perylene
	Indeno(1,2,3-cd)pyrene
	Coronene
	Phenanthrene
	Triphenylene
	Benzo(b)fluoranthene
	Anthracene
	Fluoranthene
	Pyrene
	Benz(a)anthracene
	Benz(ah)anthracene
	Chrysene
	Perylene
AMBIENT AIR Pesticides and Other Chlorinated Organics	
	Benzene sulfonyl chloride
	Tetrachlorobenzene
	4-chlorobenzene sulfonyl chloride
	4-methoxybenzene sulfonyl chloride
	Hexachlorobenzene
	2,4,5-T (methyl ester)
	Ovex
	p,p'-DDT
	Total suspended particulate
	Total inhalable particulate

TABLE 4.2.1-1

AMBIENT AIR ANALYSIS COMPONENTS

I. METALS

- Lead
- Manganese
- Copper
- Vanadium
- Cadmium
- Zinc
- Iron
- Nickel

II. VOLATILE ORGANIC COMPOUNDS (VOC's)

- Vinyl chloride
- Vinylidene chloride
- Methylene chloride (ME chloride)
- Chloroform
- 1,2-Dichloroethane
- Benzene
- Carbon tetrachloride
- Trichloroethylene (TRIC)
- 1,4-Dioxane
- 1,1,2-Trichloroethane
- Toluene
- 1,2-Dibromoethane
- Nitrobenzene
- Tetrachloroethylene (PERC)
- Chlorobenzene
- Ethylbenzene
- x-Xylene
- p-Xylene
- Styrene
- o-Xylene
- 1,1,2,2-Tetrachloroethane
- o-Chlorotoluene
- p-Chlorotoluene
- p-Dichlorobenzene
- o-Dichlorobenzene

III. POLYCYCLIC AROMATIC HYDROCARBONS (PAH's)

- Benzo(k)fluoranthene
- Benzo(a)pyrene
- Benzo(ghi)perylene
- Indeno(1,2,3-cd)pyrene
- Coronene
- Phenanthrene
- Triphenylene
- Benzo(b)fluoranthene
- Anthracene
- Fluoranthene
- Pyrene
- Benz(a)anthracene
- Benz(ah)anthracene
- Chrysene
- Perylene

IV. PESTICIDES AND OTHER CHLORINATED ORGANICS

- Benzene sulfonyl chloride
- Tetrachlorobenzene
- 4-Chlorobenzene sulfonyl chloride
- 4-Methoxybenzene sulfonyl chloride
- Hexachlorobenzene
- 2,4,5-T (methy ester)
- Ovex
- p,p'-DDT

V. ASBESTOS

VI. TETRACHLORODIBENZO DIOXIN (2,3,7,8-TCDD)

TABLE 4.2.3-1

SAMPLE SUMMARY FOR BUILDINGS, STRUCTURES, AND EQUIPMENT

DESCRIPTION		WIPE	CHIP	BULK
Office Building Interior	Areas of first and highest exposure (lab, change room, etc.)	22	5	4 (asbestos)
Exterior	Primary contact areas near roads and sidewalks	1	10	-
Warehouse Interior	Areas of highest exposure (office, lunchroom, shop)	7	4	3 (asbestos)
Exterior	Contact areas (splashing and wind borne)	1	12	-
Manufacturing Building Interior	Packaging and reaction areas	4	14	2 (asbestos)
Exterior	Wind-borne contact	1	9	-
Process Building Interior	Reaction and carbon infiltration areas	12	3	3 (asbestos) 5 (dioxin)
Exterior	High source area (example, carbon filter)	2	7	-
Stack	Flue, sludge pit, outer surface	-	3	-
Solvent Storage Shed	Representative internal and external	-	1	1 (dioxin)
Well House	Representative internal and external	-	2	-
Tanks (in buildings tank and farms)		28	-	112 (dioxin) 2 (asbestos)
TOTAL		78	70	132

TABLE 4.2.3.2-1

OFFICE AND LABORATORY BUILDING SAMPLE LOCATIONS

SAMPLE NUMBER	DESCRIPTION
WIPE SAMPLES	
1100-0016-W-L	Lab Room 1100, Main Entrance
1102-0017-W-L	Lab Room 1102, Accounting
1105-0018-W-L	Lab Room 1105, Floor, Plant Manager
1106-0021-W-L	Lab Room 1106, Floor, Back Foyer Inside Door
1107-0020-W-L	Lab Room 1107, Floor
1108-0019-W-L	Lab Room 1108, Wall
1116-0034-W-L	Lab Room 1116, Locker Room
1122-0035-W-L	Lab Room 1122, Heater Duct, Basket Room
1122-0073-W-L	Lab Room 1122, Windowsill, Basket Room
1122-0074-W-L	Lab Room 1122, Floor Near Inside Entrance
1202-0032-W-L	Lab Room 1202, Floor, Lunchroom
1202-0033-W-L	Lab Room 1202, Radiator, Lunchroom
1204-0023-W-L	Lab Room 1204, Floor by Back Door, Lab
1204-0024-W-L	Lab Room 1204, Lab Hood, Lab
1204-0025-W-L	Lab Room 1204, North Side of Entrance, Lab Side
1204-0026-W-L	Lab Room 1204, Bench Near Back Door
1205-0030-W-L	Lab room 1205, A/C Intake Duct, Utility Room
1205-0031-W-L	Lab Room 1205, Furnace Intake, Utility Room
1205-0095-W-L	Lab Room 1205, Heater Interior Inlet, Utility
1206-0027-W-L	Lab Room 1206, Floor, Small Lab
1206-0028-W-L	Lab Room 1206, Bench, Small Lab
1206-0381-W-L	Lab Room 1206, Bench, Small Lab
1506-1590-W-L	Office/Lab, West Wall, at Roof

TABLE 4.2.3.2-1
(Continued)

SAMPLE NUMBER	DESCRIPTION
CHIP SAMPLES	
1118-0049-C-L	Lab Room 1118, Floor Under Sink Edge, Washroom
1119-0050-C-L	Lab Room 1119, Floor Slop Sink
1122-0051-C-L	Lab Room 1122, Floor Under Arch Between Room 1122 and 1116
1122-0052-C-L	Lab Room 1122, Floor Near Drain, Basket Room
1122-0053-C-L	Lab Room 1122, Floor Near Back Door, Basket Room
1501-0098-C-L	Lab Exterior, 1501, Center, North Wall at Roof Sill
1501-0111-C-L	Lab Exterior, 1501, Center of North Wall, 3 to 5 feet
1501-0113-C-L	Lab Exterior, 1501, Center North Wall, Ground Level
1505-0097-C-L	Lab Exterior, 1505, South Corner, East Wall at Roofsill
1505-0108-C-L	Lab Exterior, 1505, South Corner, East Wall, 3 to 5 feet
1505-0109-C-L	Lab Exterior, 1505, South Corner, East Wall, Ground Level
1505-0110-C-L	Lab Exterior, 1505, Walkway of Front Entrance
1506-0099-C-L	Lab Exterior, 1506, Center West Wall, Top 24-inch Vertical
1506-0166-C-L	Lab Exterior, 1506, Center West Wall, 3 to 5 feet
1506-0167-C-L	Lab Exterior, 1506, Center West Wall, Ground Level

TABLE 4.2.3.2-2

WAREHOUSE SAMPLE LOCATIONS

SAMPLE NUMBER	DESCRIPTION
WIPE SAMPLES	
2100-0218-W-L	Warehouse, Room 2100, Top of Fluorescent Light
2103-0217-W-L	Warehouse, Room 2103, Floor, Foreman's Office
2108-0176-W-L	Warehouse, Room 2108, Floor, Kitchen
2108-0177-W-L	Warehouse, Room 2108, Window Sill, Kitchen
2109-0178-W-L	Warehouse, Room 2109, Top of Light Work Area, Shop
2109-0179-W-L	Warehouse, Room 2109, Top of Bench in Shop
2200-0180-W-L	Warehouse, Room 2200, Top of Beam in Storage Area
2400-0315-W-L	Warehouse, West End, Roof
CHIP SAMPLES	
2100-0168-C-L	Warehouse, Room 2100, Center of Traffic Area, Floor
2109-0169-C-L	Warehouse, Room 2109, Floor, Tool Crib Cage Area
2109-0170-C-L	Warehouse, Room 2109, Floor by Traffic Door
2109-0171-C-L	Warehouse, Room 2109, Floor by Warehouse Door
2501-0317-C-L	Warehouse, North Wall at Ground Level
2501-0391-C-L	Warehouse, North Wall at 60 inches (3 to 5 feet)

TABLE 4.2.3.2-2
(Continued)

SAMPLE NUMBER	DESCRIPTION
CHIP SAMPLES	
2501-0392-C-L	Warehouse, Exterior, North Side at Roof
2502-0319-C-L	Warehouse, South Wall at Ground Level
2502-0393-C-L	Warehouse, South Wall at 60 inches (3 to 5 feet)
2502-0529-C-L	Warehouse, Exterior, South Wall, at Roof Line
2504-0318-C-L	Warehouse, East Wall at Ground Level
2504-0527-C-L	Warehouse, Exterior, East Wall, 3 to 5 feet
2504-0528-C-L	Warehouse, Exterior, East Wall, at Roof Line
2506-0316-C-L	Warehouse, West Wall at Ground Level
2506-0389-C-L	Warehouse, West Wall at 60 inches (3 to 5 feet)
2506-0390-C-L	Warehouse, West Wall at Roof Line

TABLE 4.2.3.2-3

PROCESS BUILDING SAMPLE LOCATIONS

SAMPLE NUMBER	DESCRIPTION
WIPE SAMPLES	
4100-0556-W-L	Process Bldg., East End, Near Vessel, Top of Light, First Floor
4100-0557-W-L	Process Bldg., East End, Low on Column, Near Vessel, First Floor
4100-0558-W-L	Process Bldg., Center, First Floor, Top of Light, Near Vessel
4100-0559-W-L	Process Bldg., Center, First Floor, Low on Column, Near Vessel
4100-0560-W-L	Process Bldg., West End, First Floor, Top of Light, Near Vessel
4100-0561-W-L	Process Bldg., West End, First Floor, Low on Column, Near Vessel
4200-0608-W-L	Process Bldg., Second Floor, West End Interior Wall
4200-0609-W-L	Process Bldg., Second Floor, Acid Room Wall (Interior)
4200-0610-W-L	Process Bldg., Second Floor, East End Interior Wall
4300-0611-W-L	Process Bldg., Third Floor, East End Interior Wall
4300-0612-W-L	Process Bldg., Third Floor, Surface, Center
4300-0613-W-L	Process Bldg., Third Floor, Surface, East End
4400-0495-W-L	Process Bldg., Roof, Northeast Quadrant
4400-0496-W-L	Process Bldg., Roof, Southwest Corner
CHIP SAMPLES	
4100-0553-C-L	Process Bldg., Floor, West End of First Floor
4100-0554-C-L	Process Bldg., Floor at Loading Door, First Floor
4100-0555-C-L	Process Bldg., Floor, East End Under Vessel, First Floor
4501-0424-C-L	Process Bldg., Exterior, North Wall, 0 to 24 inches
4502-0451-C-L	Process Bldg., South Wall, Near Roof at Vert Stairs, Exterior
4503-0427-C-L	Process Bldg., Exterior, South at C Filter, 24 inches Over Curb

TABLE 4.2.3.2-3
(Continued)

SAMPLE NUMBER	DESCRIPTION
CHIP SAMPLES	
4504-0452-C-L	Process Bldg., East Wall, Over Trench Near Vessels (0 to 24 inches)
4506-0425-C-L	•Process Bldg., Exterior Bin Wall, West Side, 0 to 24 inches
4506-0426-C-L	Process Bldg., Exterior, Bin Wall, West Side, 36 to 60 inches
BULK SAMPLES	
4501-0455-B-L	Process Bldg., North Wall, 36 to 60 inches
4501-0493-B-L	Process Bldg., North Wall, 24 inches from top (Off Louvers)
4503-0456-B-L	Process Bldg., South Wall, 36 to 60 inches
4504-0453-B-L	Process Bldg., East Wall, Near Vessels (36 to 60 inches)
4504-0454-B-L	Process Bldg., East Wall, at Roof Near Vessels

TABLE 4.2.3.2-4

CHEMICAL MANUFACTURING BUILDING SAMPLE LOCATIONS

SAMPLE NUMBER	DESCRIPTION
WIPE SAMPLES	
3100-0658-W-L	Mftg. Bldg., First Floor, Packing Area, Rafter
3200-0655-W-L	Mftg. Bldg., Second Floor, New Addition, Floor, South End
3200-0656-W-L	Mftg. Bldg., Second Floor, New Addition, Panel, Center
3200-0657-W-L	Mftg. Bldg., Second Floor, New Addition, North End, Beam
3502-0716-W-L	Mftg. Bldg., South Exterior Door
CHIP SAMPLES	
3100-0619-C-L	Mftg. Bldg., Old Area, Roof Slab, South of Center Vessel
3100-0620-C-L	Mftg. Bldg., Old Area, Roof Slab, West of North Vessel
3100-0621-C-L	Mftg. Bldg., Bulk Debris from Drain Area
3100-0622-C-L	Mftg. Bldg., Old Area, 1st Floor, Floor North End North Room
3100-0633-C-L	Mftg. Bldg., Old Area, Floor, Center
3100-0634-C-L	Mftg. Bldg., Old Area, Floor, South
3100-0635-C-L	Mftg. Bldg., Packing Area, Floor at Main Door
3100-0636-C-L	Mftg. Bldg., Packing Area, Floor at Packing Chute
3100-0639-C-L	Mftg. Bldg., Packing Area, Low on East Wall
3100-0640-C-L	Mftg. Bldg., Packing Area, 30 to 60 inches on West Wall
3100-0641-C-L	Mftg. Bldg., New Addition, Southwest Wall, Interior
3100-0652-C-L	Mftg. Bldg., First Floor, Southwest Floor Under Vessel
3100-0653-C-L	Mftg. Bldg., First Floor, New Addition, Center Floor by Pump

TABLE 4.2.3.2-4
(Continued)

SAMPLE NUMBER	DESCRIPTION
WIPE SAMPLES	
3200-0654-C-L	Mftg. Bldg., Second Floor, New Addition, North Wall by Door
3501-0690-C-L	Mftg. Bldg., Exterior, North Wall, 0 to 24 inches by Main Door
3501-0691-C-L	Mftg. Bldg., Exterior, North Wall, 36 to 60 inches by Main Door
3502-0696-C-L	Mftg. Bldg., Exterior, South, Under Load-Out Door
3502-0697-C-L	Mftg. Bldg., Exterior, South Wall, 0 to 24 inches, Package Area Door
3502-0698-C-L	Mftg. Bldg., Exterior, South Wall, 36 to 60 inches, Package Area Door
3506-0692-C-L	Mftg. Bldg., Exterior, West Wall, 0 to 24 inches, by Large North Door
3506-0693-C-L	Mftg. Bldg., Exterior, West Wall, 36 to 60 inches, by Large North Door
3506-0694-C-L	Mftg. Bldg., Exterior, West Wall, 0 to 24 inches, by South Stairway
3506-0695-C-L	Mftg. Bldg., Exterior, West Wall, 36 to 60 inches, by South Stairway

TABLE 4.2.5-1

COORDINATES AND ELEVATIONS OF NEAR SURFACE SOIL SAMPLES, BORINGS, AND MONITORING WELLS

IDENTIFICATION	COORDINATES(1)		GROUND SURFACE
	NORTH	EAST	ELEVATION(2)
NEAR SURFACE SOIL SAMPLES			
A-2-G	21.0	71.0	99.3
A-4-F	28.0	239.0	100.5
A-5-G	28.1	233.9	99.1
B-2-M	96.7	57.4	98.5
C-6-B	138.9	283.3	98.8
D-4-N	188.7	140.1	103.0
E-1-G	259.4	24.1	98.3
E-5-D	195.4	226.6	98.3
G-3-I	346.0	92.5	99.7
G-3-L	309.6	133.1	99.6
G-4-A	356.3	187.8	100.0
G-5-F	323.3	205.4	99.5
H-1-H	381.7	30.0	98.6
H-2-B	395.2	85.5	100.4
H-2-H	365.3	63.7	99.5
H-5-F	395.2	204.8	99.5
H-7-F	415.0	344.0	98.4
H-7-H	357.3	343.3	98.9
J-6-K	394.0	260.0	102.3
MONITORING WELLS			
MW-1A	418.2	50.0	98.7
MW-2A	440.3	214.2	98.9
MW-3A	450.4	336.9	97.3
MW-4A	147.3	339.7	97.6
MW-5A	37.7	44.6	98.9
MW-6A	14.2	137.9	98.9
MW-7A	178.0	30.3	98.4
MW-8A	280.8	335.7	99.7
MP-9A(3)	337.6	224.5	99.5

See footnotes at end of table.

TABLE 4.2.5-1
(Continued)

IDENTIFICATION	COORDINATES(1)		GROUND SURFACE
	NORTH	EAST	ELEVATION(2)
BORINGS			
B-1	416.7	50.6	98.7
B-2	439.3	217.3	98.9
B-3	450.0	332.3	97.3
B-4	142.8	340.2	97.6
B-5	38.3	49.7	98.9
B-6	14.1	141.6	98.9
B-7	177.4	24.9	98.4
B-8	274.3	336.1	97.7
B-9	270.2	212.2	99.3
B-10(4)	360.4	225.4	99.7
B-11(4)	313.0	228.2	99.2
B-12	348.9	224.2	99.7
B-13	346.0	224.0	98.0
B-14	-260.0	136.0	99.7
EXISTING BORINGS			
B-1-60	217.0	170.0	103.0
B-2-60	396.0	174.0	100.4
B-3-60	419.0	116.0	98.8
B-4-60	104.0	166.0	98.8
B-5-60	47.0	192.0	100.5

(1) Coordinates are with respect to site grid (Figure 4.2.5-1).

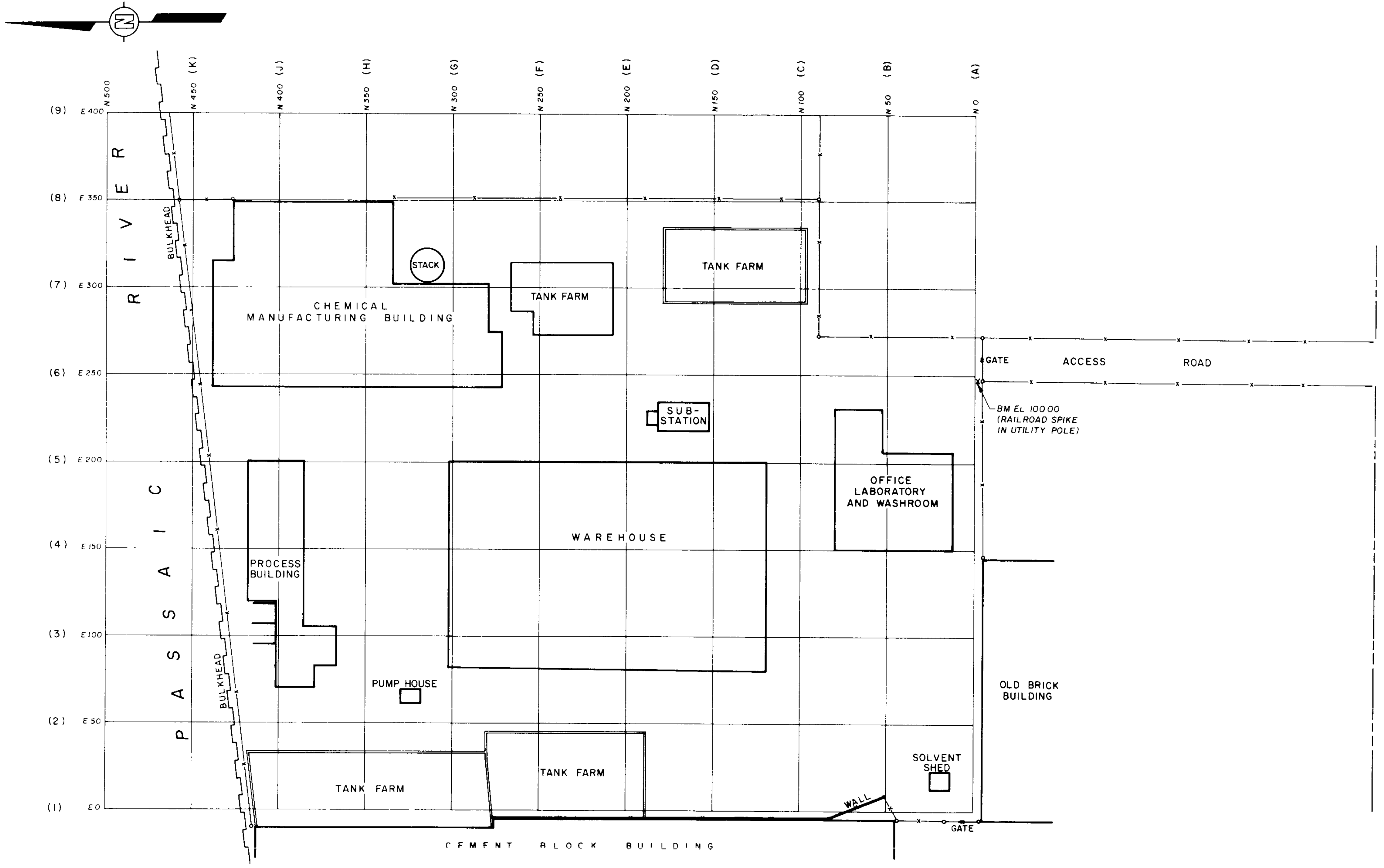
(2) Ground surface elevations are with respect to site datum.

(3) MP-9A is a piezometer installed in the glaciofluvial sands.

(4) Borings B-10 and B-11 were also designated as Near-Surface Soil Sample Locations G-5-E and F-5-E, respectively.

FIGURES

DRAWN BY	RW	CHECKED BY			DRAWING NUMBER	846248-E13
	1-25-85	APPROVED BY		2-15-85		



SCALE

0 30 60 90 FEET

FIGURE 4.0-1

PLAN LOCATIONS OF BUILDINGS AND STRUCTURES

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

Do Not Scale This Drawing

DRAWING NUMBER 846248-A45

CHECKED BY

APPROVED BY

DRAWN BY J. LOGRECO 2-9-85

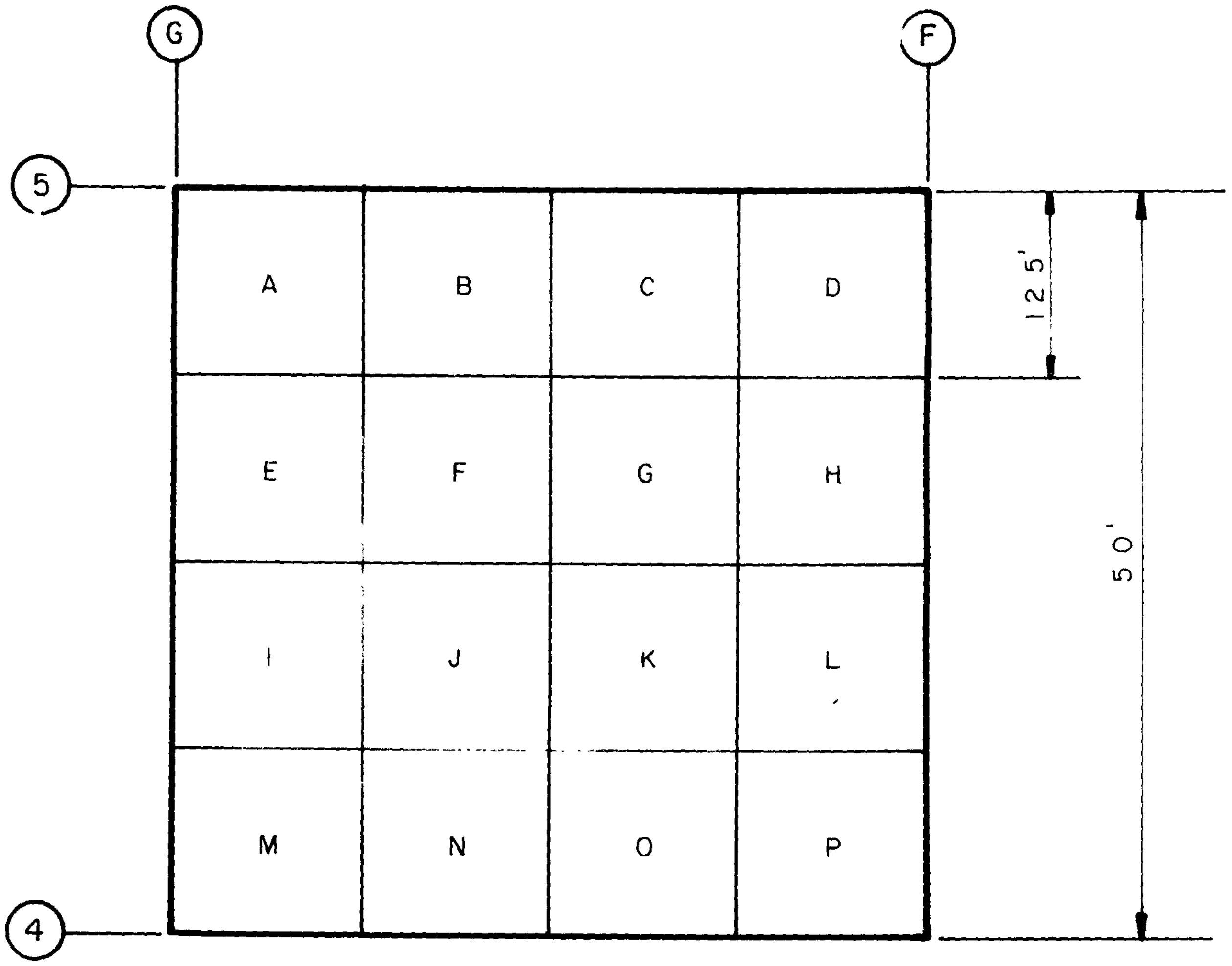


FIGURE 4.0-2

GRID SUBDIVISION IDENTIFICATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

IT ...Creating a Safer Tomorrow

Do Not Scale This Drawing

DRAWN BY	RW	1-29-85	
CHECKED BY	JTD	2-15-85	DRAWING NUMBER 846248-B13
APPROVED BY	DGE	2-15-85	

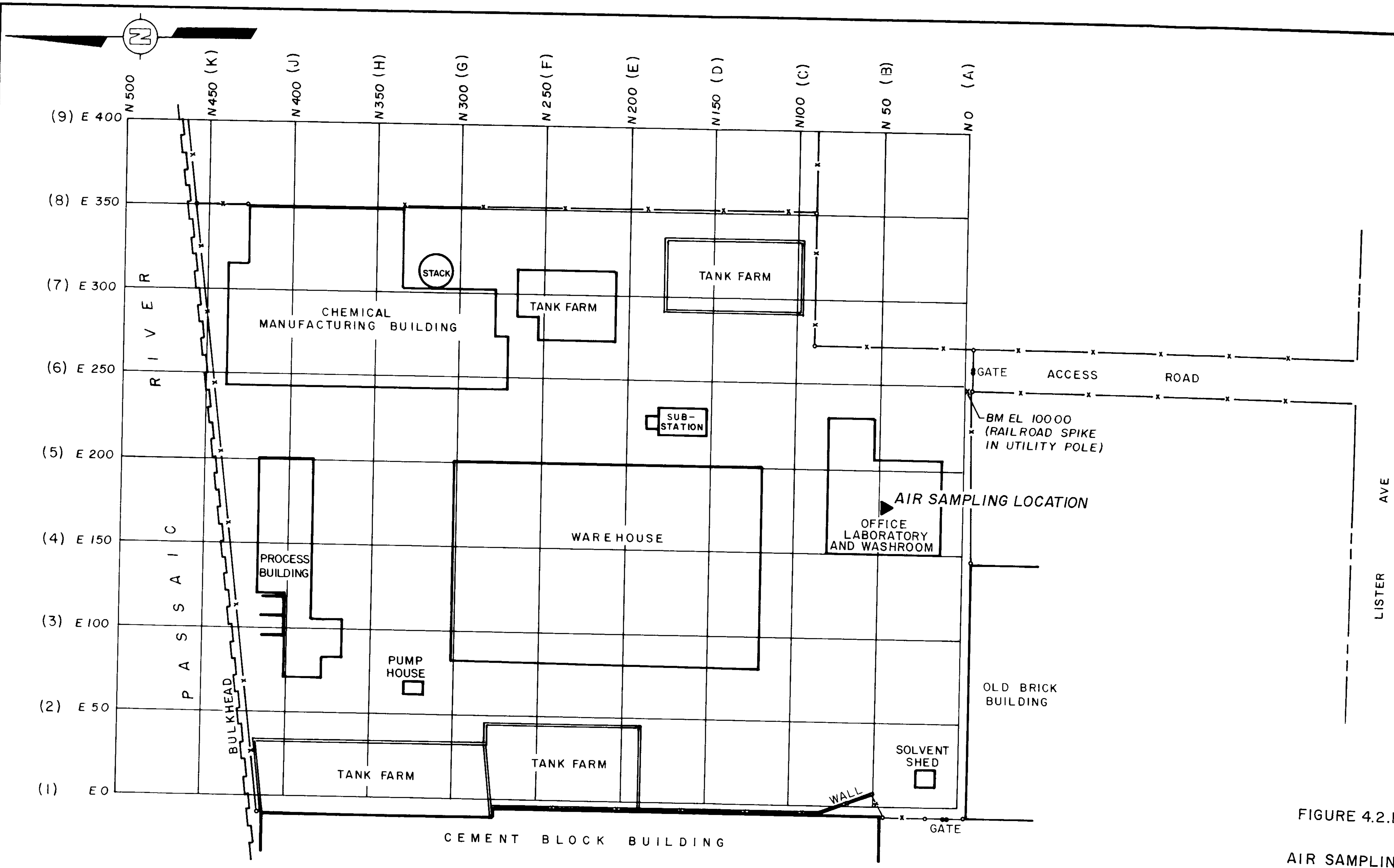


FIGURE 4.2.1-1

AIR SAMPLING
AND MONITORING LOCATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

SCALE
0 60 120 FEET

IT ...Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

CHECKED BY
APPROVED BY

TRS
1-29-85

DRAWN BY

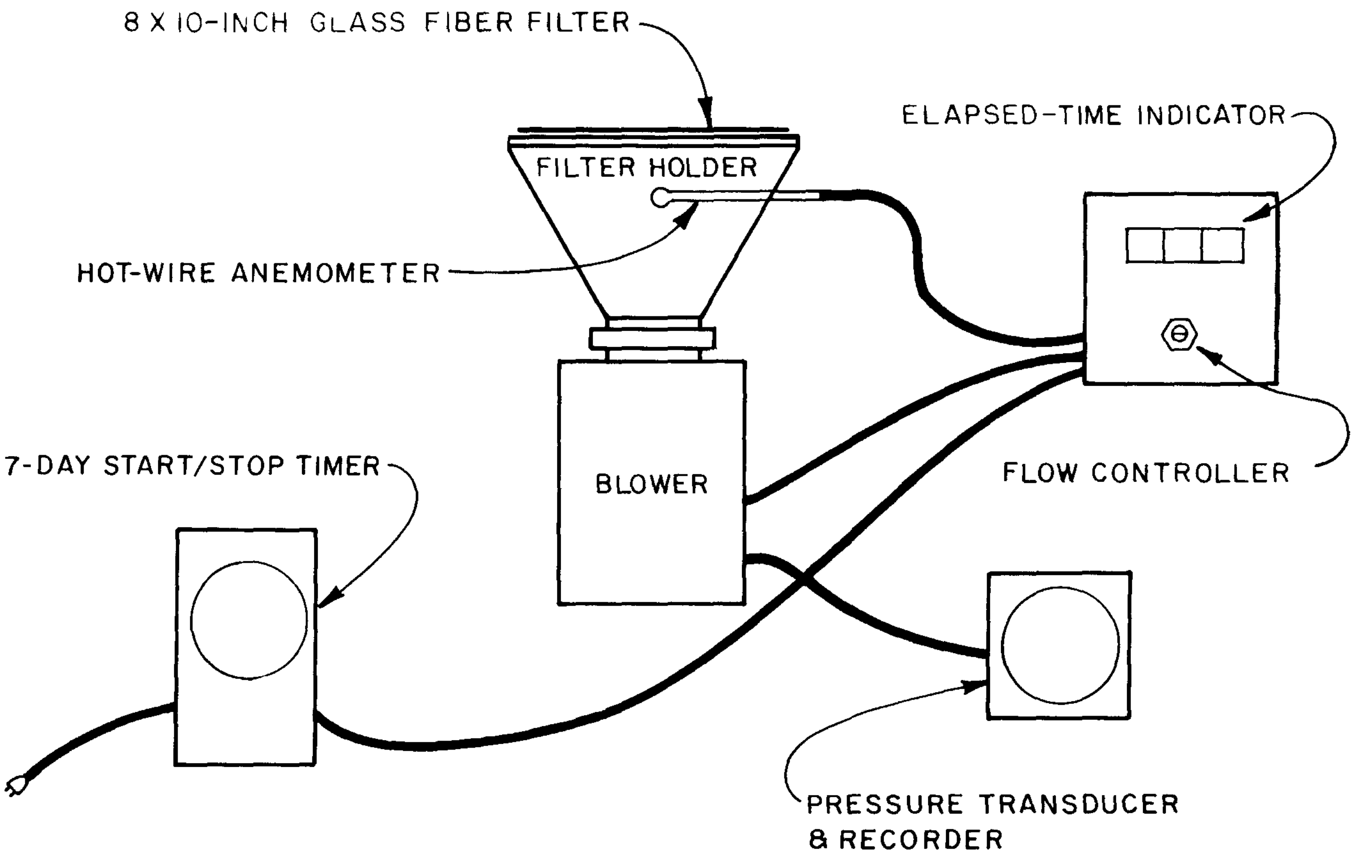


FIGURE 4.2.1-2

SCHEMATIC DIAGRAM OF THE
HIGH VOLUME AIR SAMPLER (TSP & PAH's)

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

IT ... Creating a Safer Tomorrow

Do Not Scale This Drawing

DRAWN BY	TRS	1-29-85
CHECKED BY	JTO	2-15-85
APPROVED BY	TGE	2-15-85
DRAWING NUMBER	846248-A23	

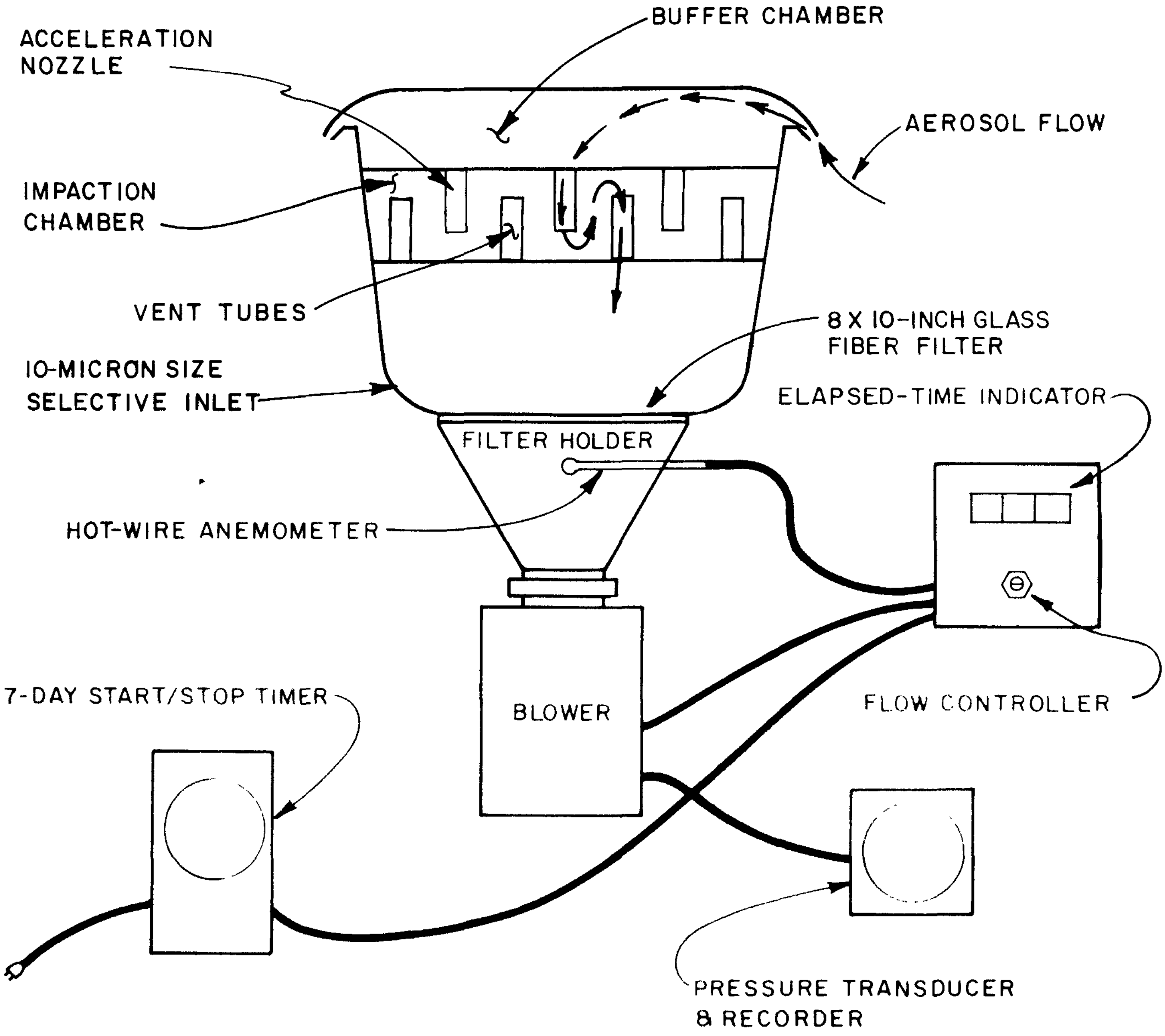


FIGURE 4 2 1-3

SCHEMATIC DIAGRAM OF THE HIGH VOLUME SAMPLER EQUIPPED WITH A 10-MICRON SIZE SELECTIVE INLET (IPM AND METALS)

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

Do Not Scale This Drawing

IT Creating a Safer Tomorrow

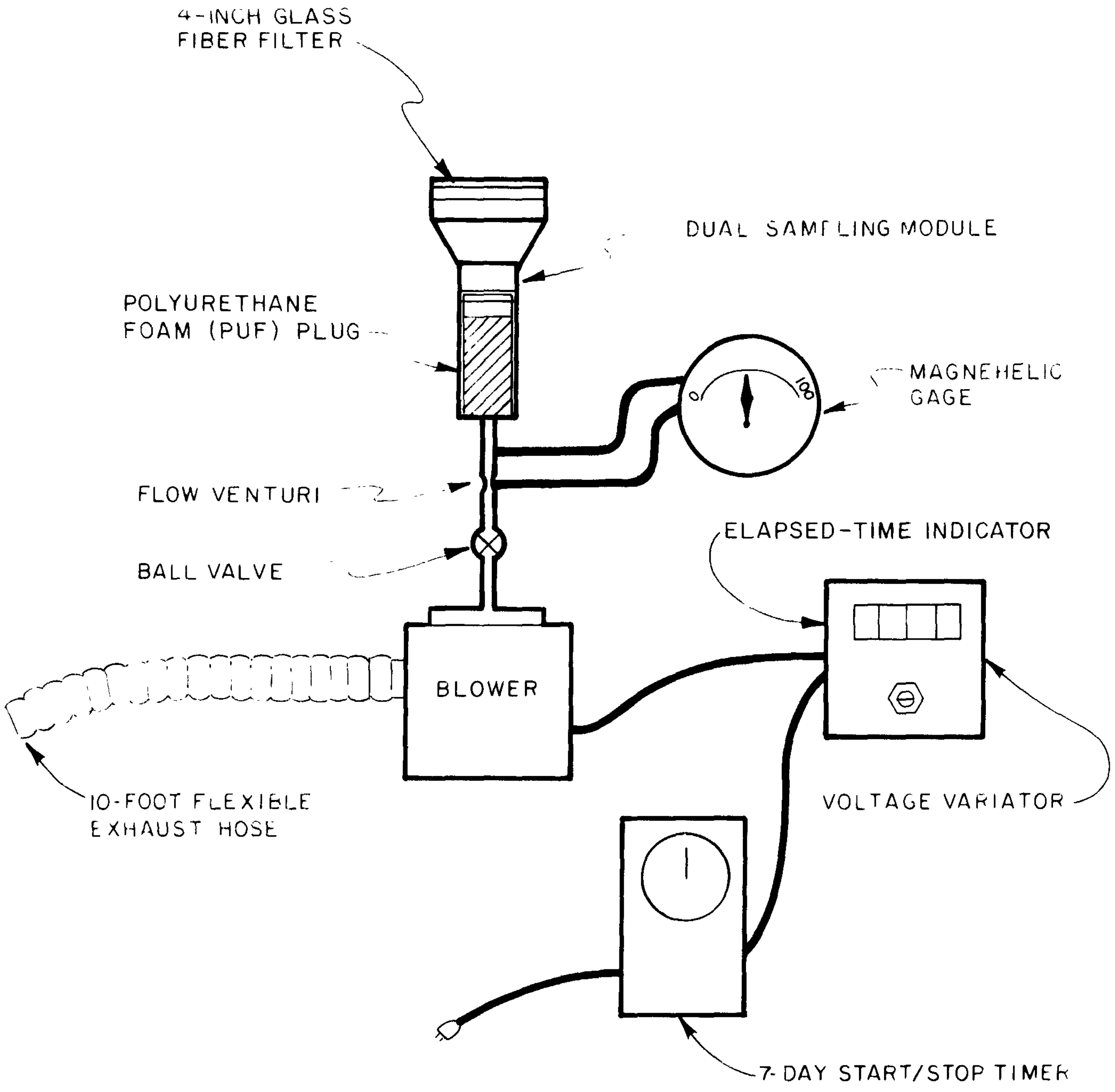


FIGURE 4.2.1-4

SCHEMATIC DIAGRAM OF THE PUF SAMPLER (DIOXIN, PESTICIDES AND OTHER CHLORINATED ORGANICS)

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT . . . Creating a Safer Tomorrow

DRAWING NUMBER 846248-A21

CHECKED BY

APPROVED BY

TRS
1-29-85

DRAWN BY

65360

Do Not Scale This Drawing

DRAWING NUMBER 846248-A24

DRAWN BY mel 1-29-85

CHECKED BY JTC 2-15-85

APPROVED BY DGE 2-15-85

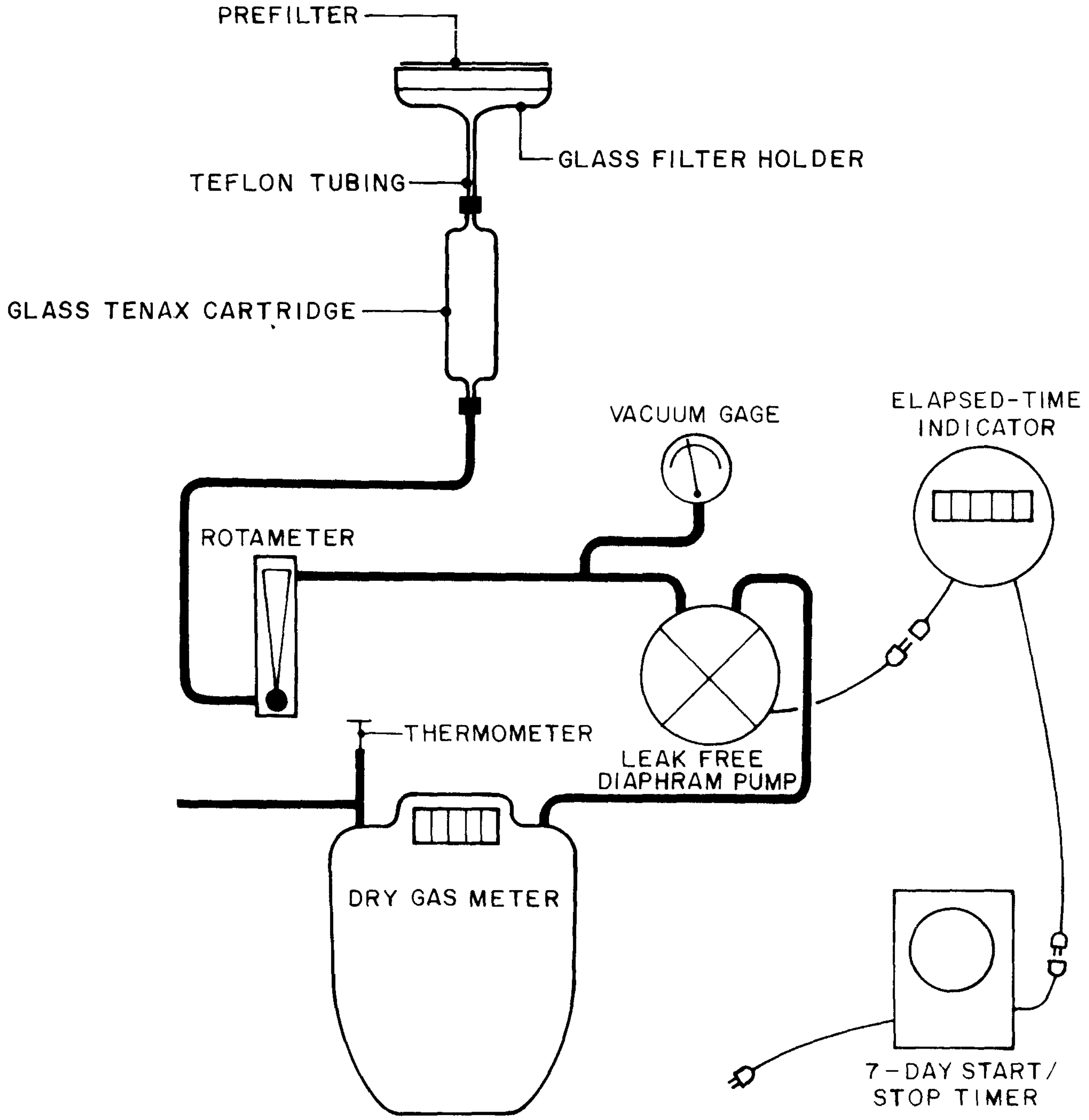


FIGURE 4.2.1-5

SCHEMATIC DIAGRAM OF
TENAX SAMPLING TRAIN (VOC'S)

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

846248-A25

JTU 2-15-85

DGE 2-15-85

mel 1-29-85

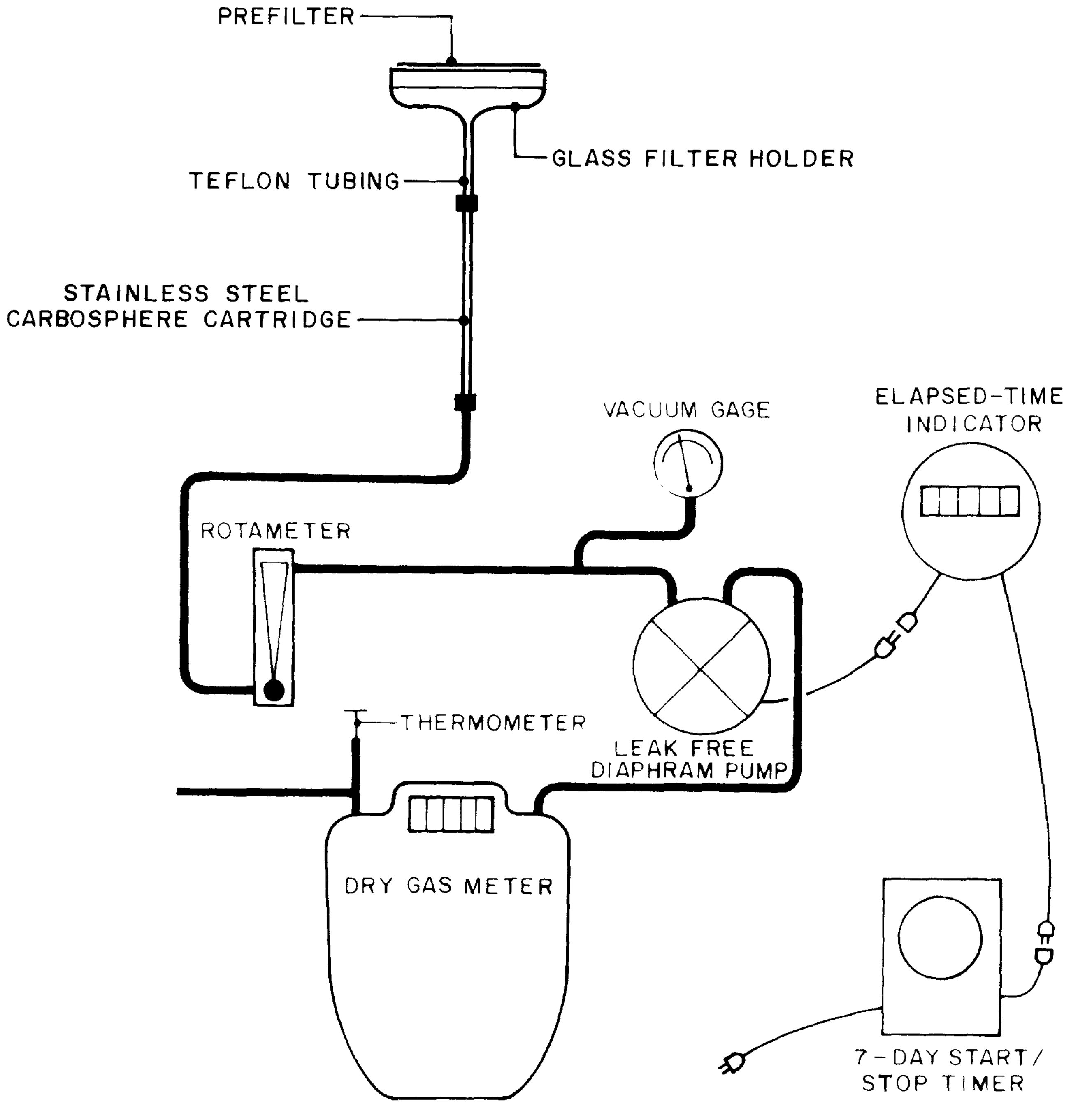


FIGURE 4 2 1-6

SCHEMATIC DIAGRAM OF
CARBOSPHERE SAMPLING TRAIN
(VINYL CHLORIDE)

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

Creating a Safer Tomorrow

65360

[illegible]

DRAWING NUMBER 846248-A26

CHECKED BY JTO 2-15-85

APPROVED BY DGE 2-15-85

DRAWN BY me 1-29-85

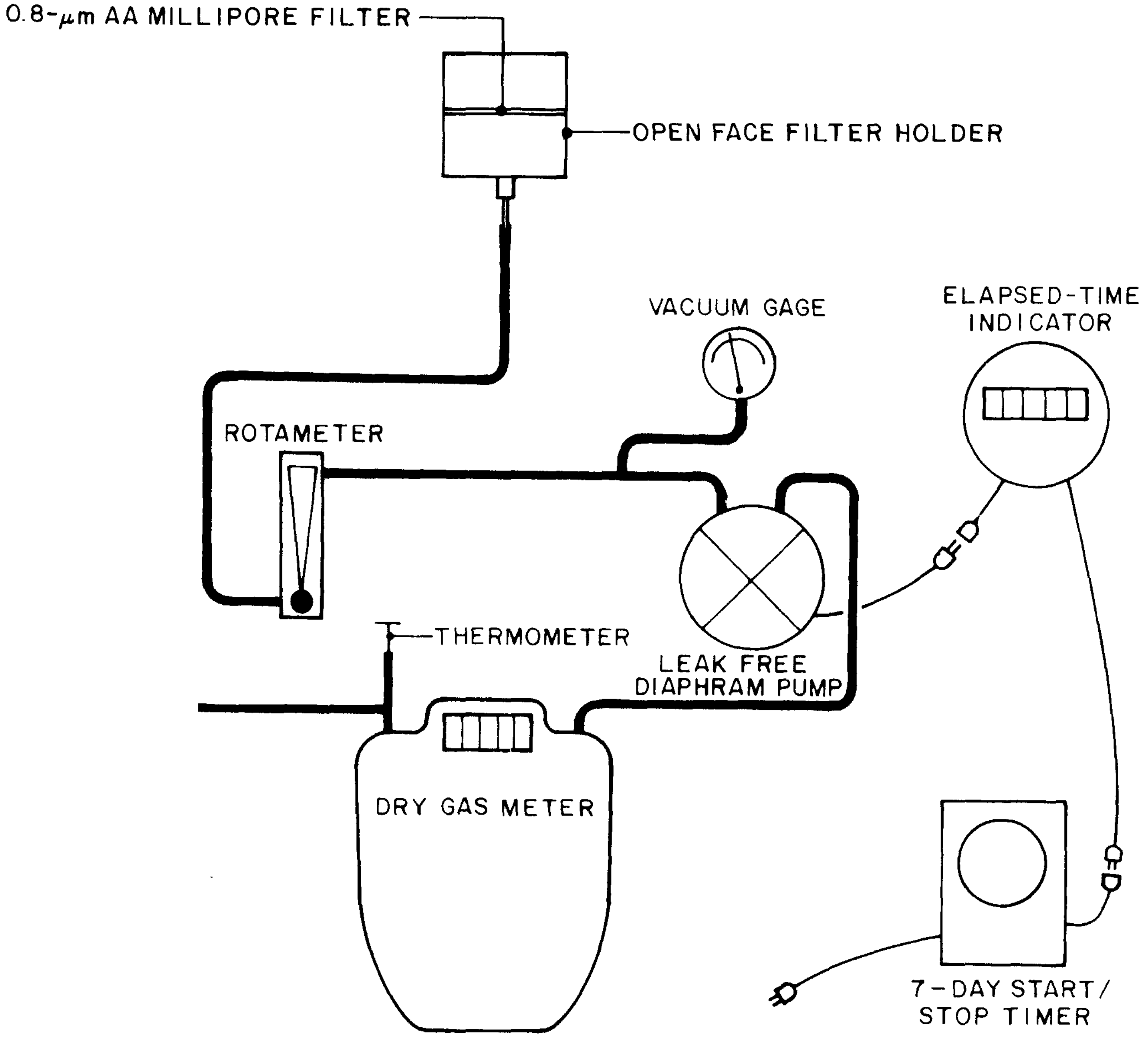


FIGURE 4.2.1-7

SCHEMATIC DIAGRAM OF
ASBESTOS SAMPLING TRAIN

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

. . . Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

DRAWN BY	D.Weick	2-1-85
CHECKED BY	JTD	2-15-85
APPROVED BY	DGE	2-15-85
DRAWING NUMBER	846248-B20	

AIR MONITORING DATA SHEET

TSP & PAH Sample	IPM & Metals Sample	PUF Sample	Asbestos Sample	VOC Sample	VOC	VOC
Sampler I.D.	Sampler I.D.	Sampler I.D.	Sampler I.D.	Sampler I.D.	Sampler I.D.	Sampler I.D.
Sample No.	Sample No.	Sample No.	Sample No.	Tube Type	Tube Type	Tube Type
Filter No. ____ Start Date ____ Time ____	Filter No. ____ Start Date ____ Time ____	PUF ____ Filter No. ____ Start Date ____ Time ____	Cassette No. ____ Start Date ____ Time ____	Sample No. ____ Start Date ____ Time ____	Sample No. ____ Start Date ____ Time ____	Sample No. ____ Start Date ____ Time ____
Stop Date ____ Time ____	Stop Date ____ Time ____	Stop Date ____ Time ____	Stop ____ Date ____ Time ____	Stop Date ____ Time ____	Stop Date ____ Time ____	Stop Date ____ Time ____
Timer Final ____ Initial ____ Duration ____	Timer Final ____ Initial ____ Duration ____	Timer Final ____ Initial ____ Duration ____	Timer Final ____ Initial ____ Duration ____	Timer Final ____ Initial ____ Duration ____	Timer Final ____ Initial ____ Duration ____	Timer Final ____ Initial ____
Indicated Flow Rate Initial ____ Final ____ Average ____	Indicated Flow Rate Initial ____ Final ____ Average ____	Flow Venturi ΔP Initial ____ Final ____ Average ____	Rotameter Reading Initial ____ Final ____	Rotameter Reading Initial ____ Final ____	Rotameter Reading Initial ____ Final ____	Rotameter Reading Initial ____ Final ____
Actual Flow Rate Average ____	Actual Flow Rate Average ____	Actual Flow Rate Average ____	Vacuum Reading Initial ____ Final ____	Vacuum Reading Initial ____ Final ____	Vacuum Reading Initial ____ Final ____	Vacuum Reading Initial ____ Final ____
Total Sample Volume	Total Sample Volume	Total Sample Volume	Dry Gas Meter Reading Initial ____ Final ____ Volume ____	Dry Gas Meter Reading Initial ____ Final ____ Volume ____	Dry Gas Meter Reading Initial ____ Final ____ Volume ____	Dry Gas Meter Reading Initial ____ Final ____ Volume ____
Comments:			Dry Gas Meter Temp. Initial ____ Final ____	Dry Gas Meter Temp. Initial ____ Final ____	Dry Gas Meter Temp. Initial ____ Final ____	Dry Gas Meter Temp. Initial ____ Final ____
Weather Conditions and Comments: Temp: B.P.: R.H.:			Calibration Factor Total Sample Volume Comments:	Calibration Factor Total Sample Volume Comments:	Calibration Factor Total Sample Volume Comments:	Calibration Factor Total Sample Volume Comments:

FIGURE 4.2.1-8

AIR MONITORING DATA SHEET

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT . . . Creating a Safer Tomorrow

65360

"Do Not Scale This Drawing"

DRAWING NUMBER 846248-A44

CHECKED BY

APPROVED BY

D Weick 1-29-85

DRAWN BY

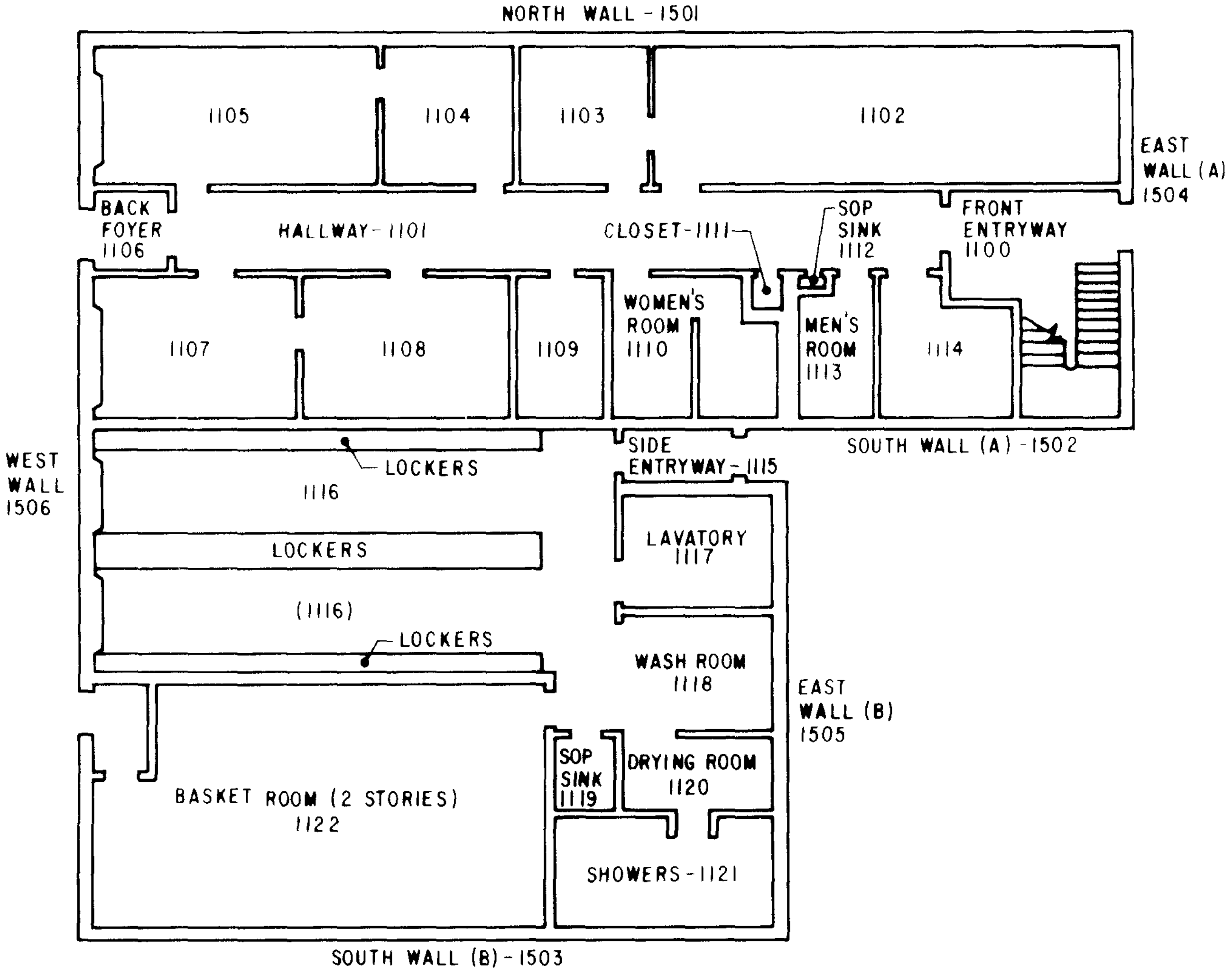


FIGURE 4.2.32-1

OFFICE AND LABORATORY BUILDING
ROOM AND EXTERIOR WALL CODES
FIRST FLOOR (1100 SERIES)
EXTERIOR (1500 SERIES)

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

... Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

DRAWN BY D Weick 1 29 85

CHECKED BY

APPROVED BY

DRAWING NUMBER 846248-A43

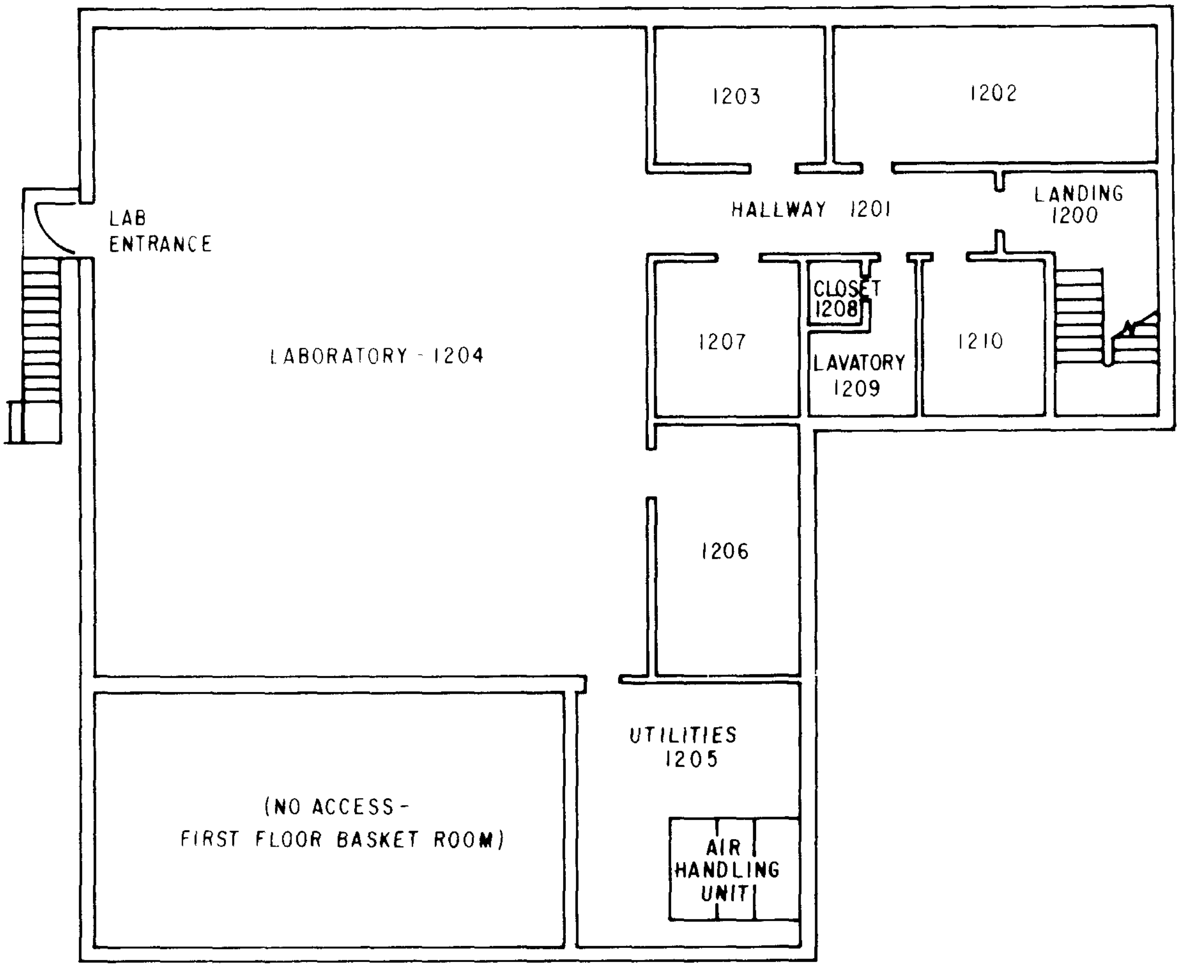


FIGURE 4.2.3.2-2

OFFICE AND LABORATORY
BUILDING ROOM CODES
SECOND FLOOR (1200 SERIES)

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT Creating a Safer Tomorrow

65360

DRAWING NUMBER 846248-A42

CHECKED BY

APPROVED BY

DRAWN BY D Weick 29

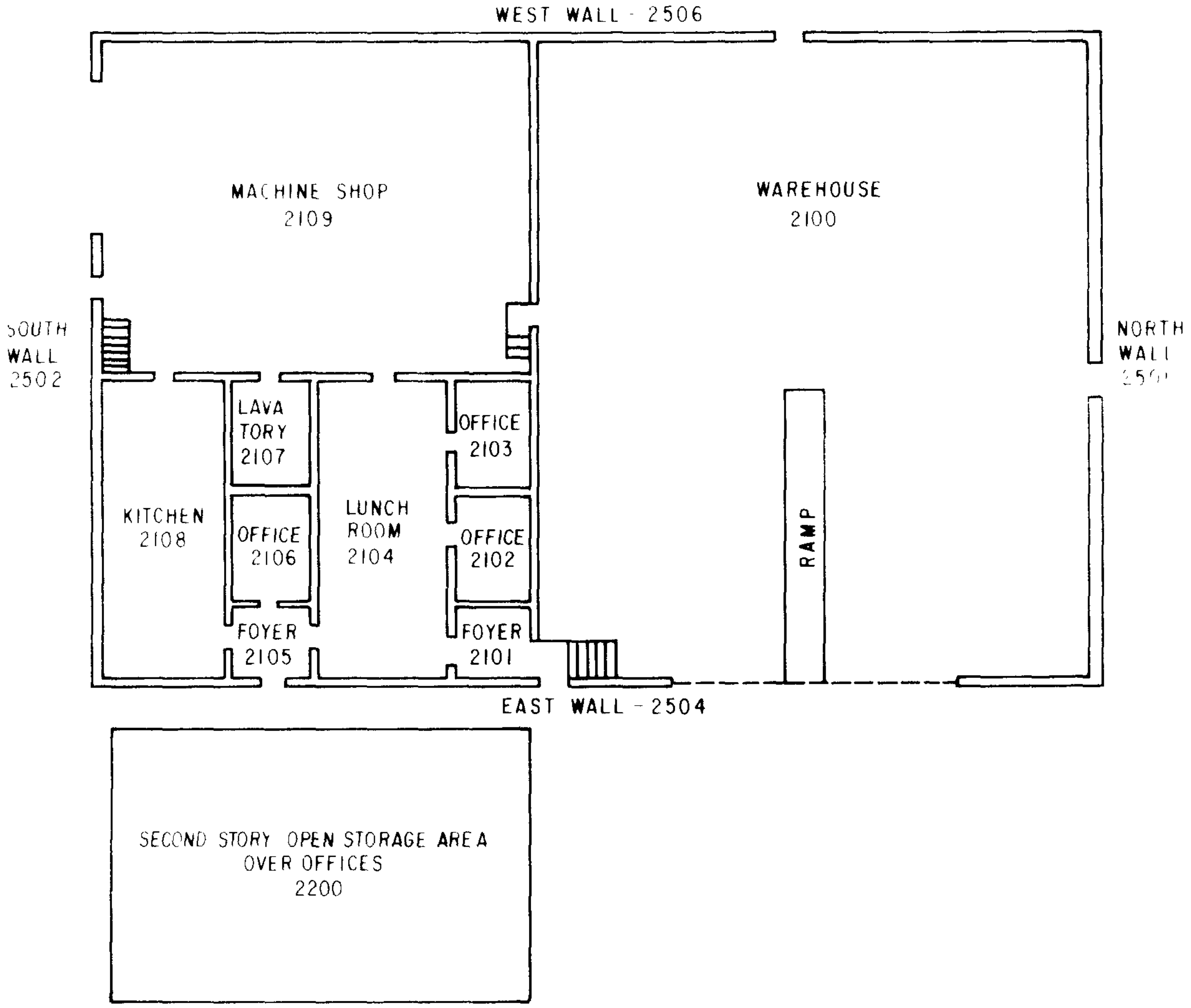


FIGURE 4.2.3.2-3

WAREHOUSE ROOM AND
EXTERNAL WALL CODES

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT

Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

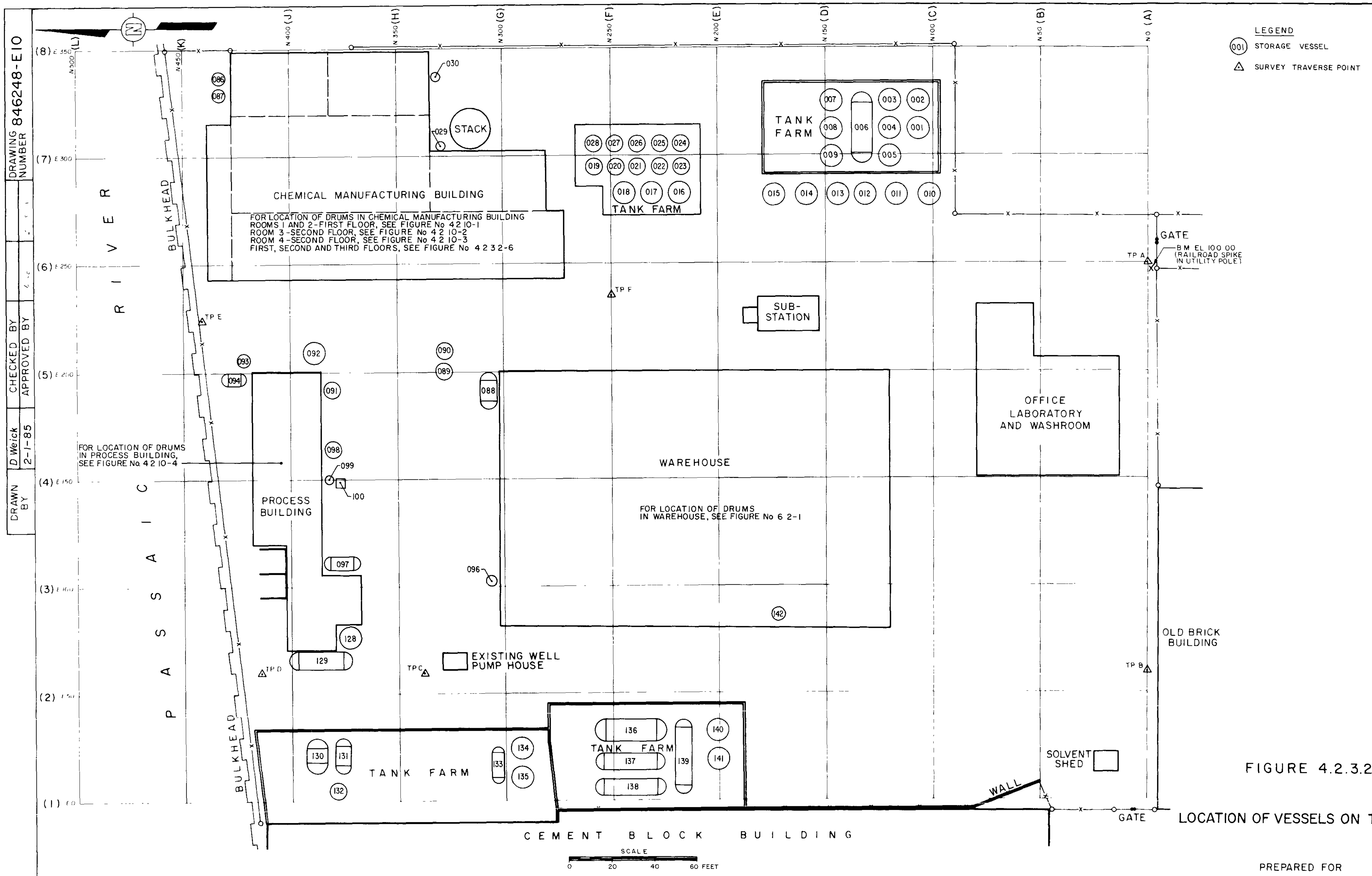


FIGURE 4.2.3.2-4

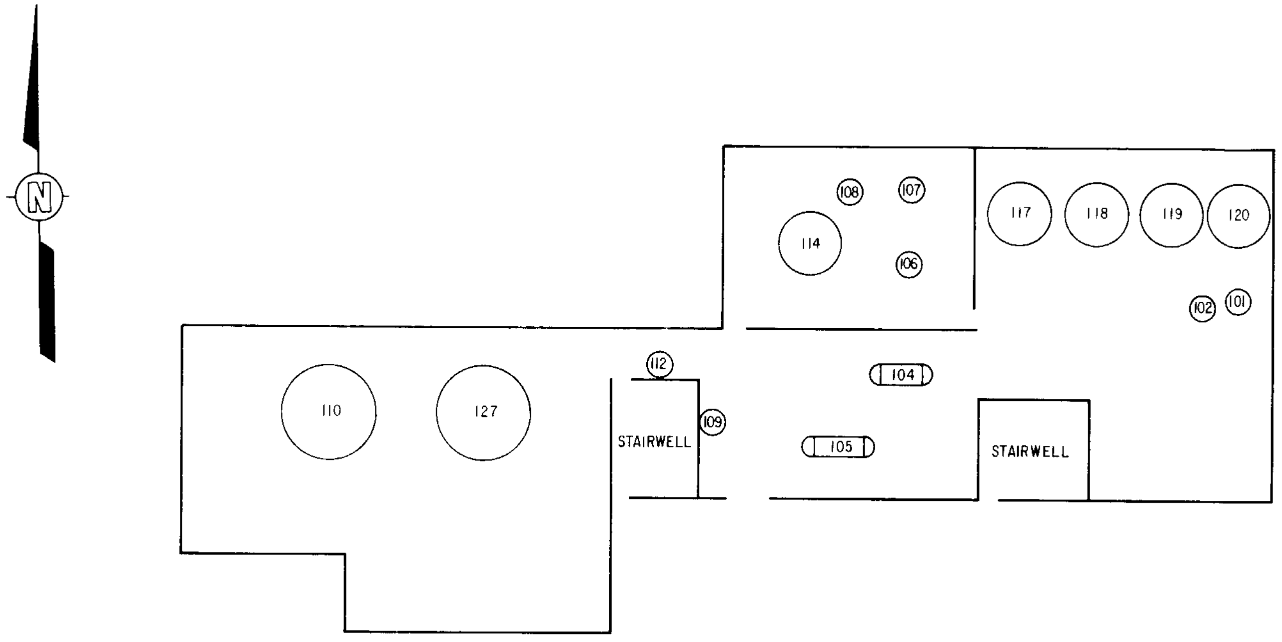
LOCATION OF VESSELS ON THE SITE

PREPARED FOR

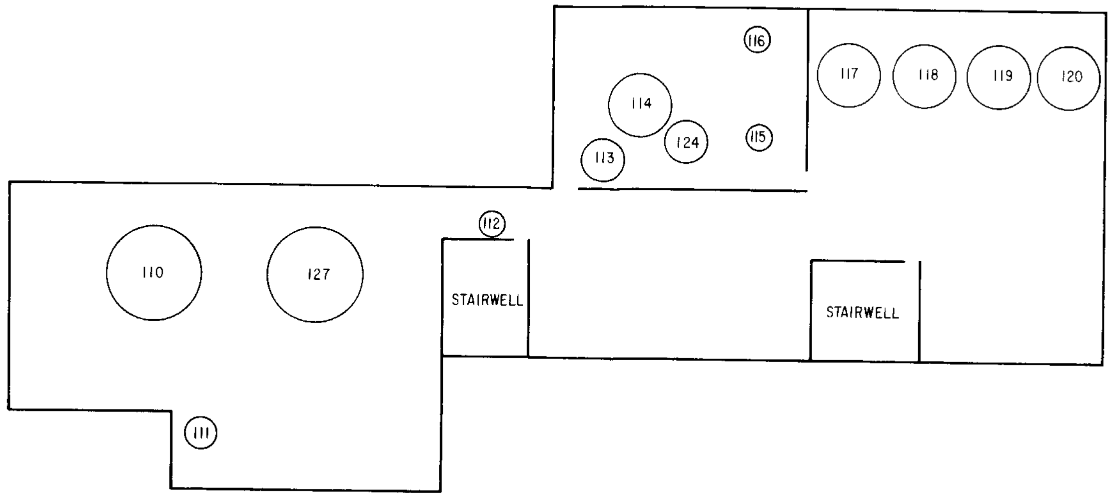
DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

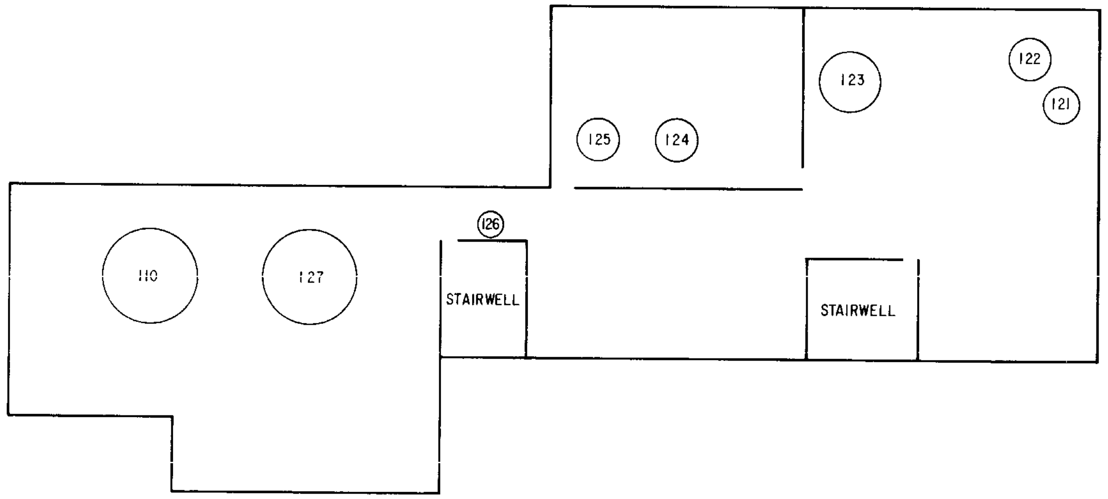
DRAWN BY	D Weick 2-1-85	CHECKED BY APPROVED BY		DRAWING NUMBER 846248-E10



FIRST FLOOR



SECOND FLOOR



THIRD FLOOR

NOTE
FOR PLAN AND LOCATION OF PROCESS BUILDING,
SEE FIGURE No 4 2 3 2-4

FIGURE 4.2.3.2-5

LOCATION OF VESSELS
PROCESS BUILDING

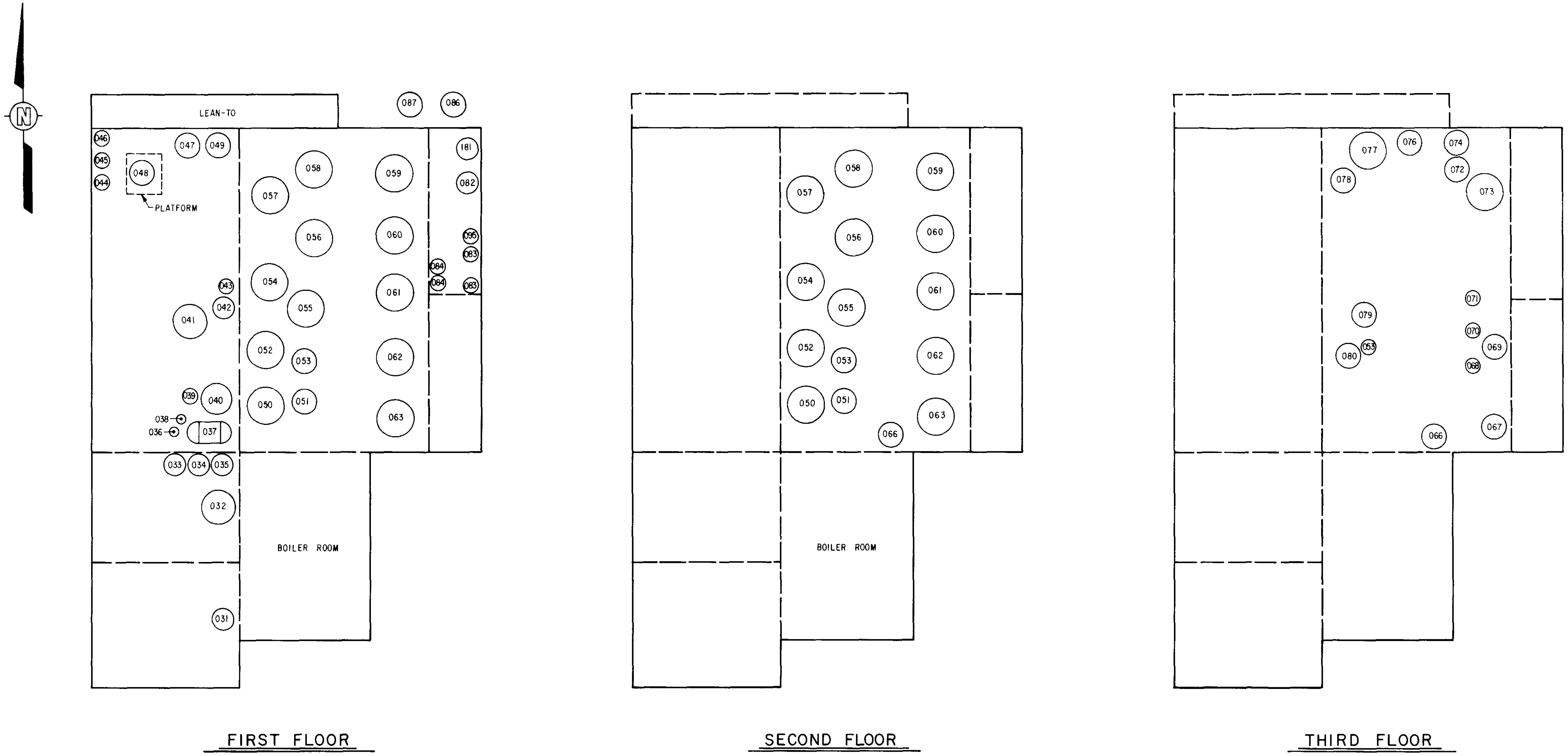
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT . . . Creating a Safer Tomorrow

DRAWN BY	RW	CHECKED BY	JTO	2 15 85	DRAWING NUMBER 846248-E11
	11-16-84	APPROVED BY	DGE	2 17 85	

DRAWN BY	RW	CHECKED BY	JTO	2 15 85	DRAWING NUMBER 846248-E12
	11-16-84	APPROVED BY	DGE	2-15 85	



FIRST FLOOR

SECOND FLOOR

THIRD FLOOR

NOTE
FOR PLAN AND LOCATION OF CHEMICAL MANUFACTURING BUILDING, SEE FIGURE No 4 2 3 2-4

FIGURE 4.2.3.2-6

LOCATION OF VESSELS
CHEMICAL MANUFACTURING BUILDING

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
J. LOGRECO 2-9-85	JTO 2-15-85	DGE 2-15-85	846248-B24

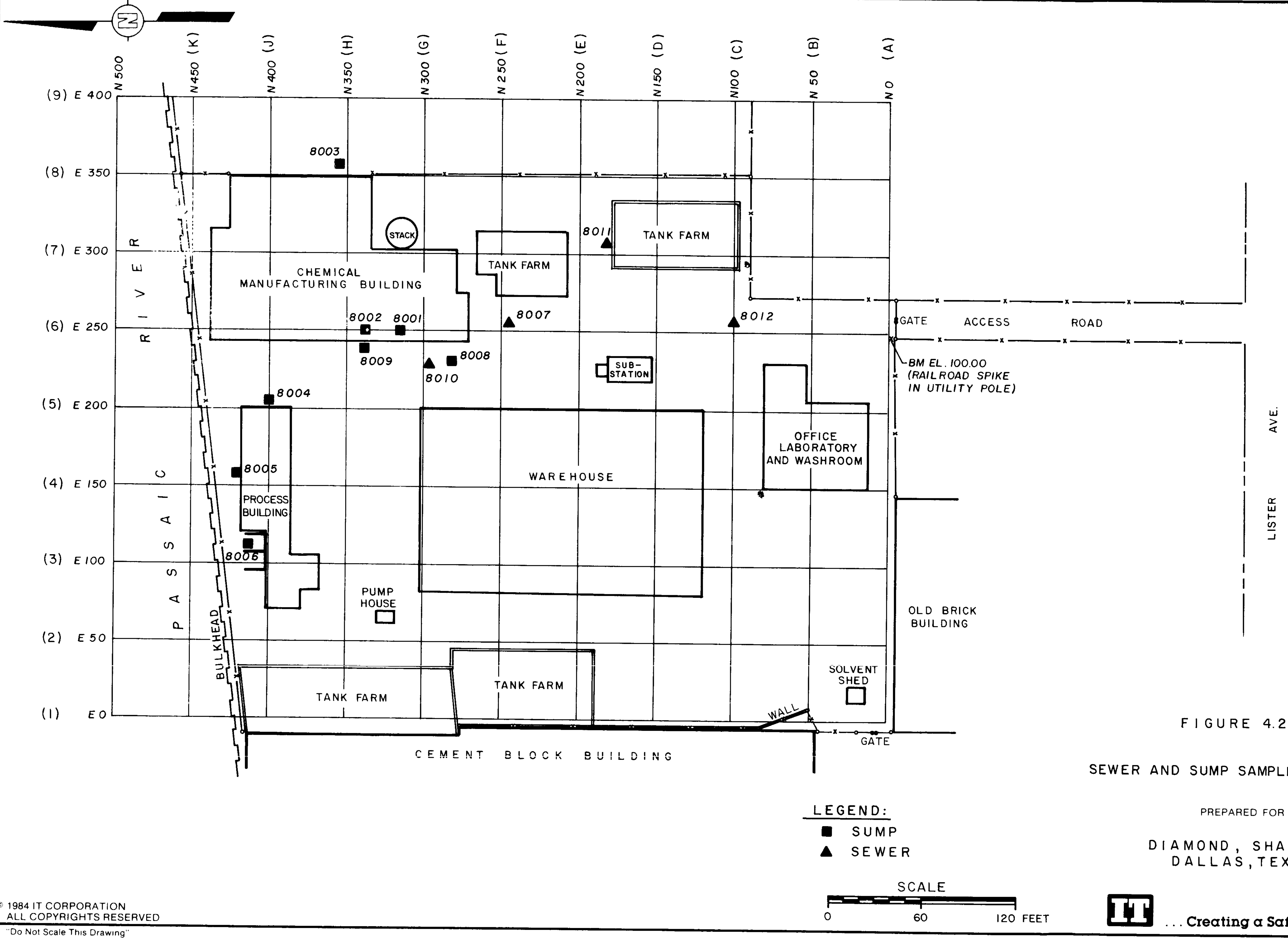


FIGURE 4.2.4-1

SEWER AND SUMP SAMPLING LOCATIONS

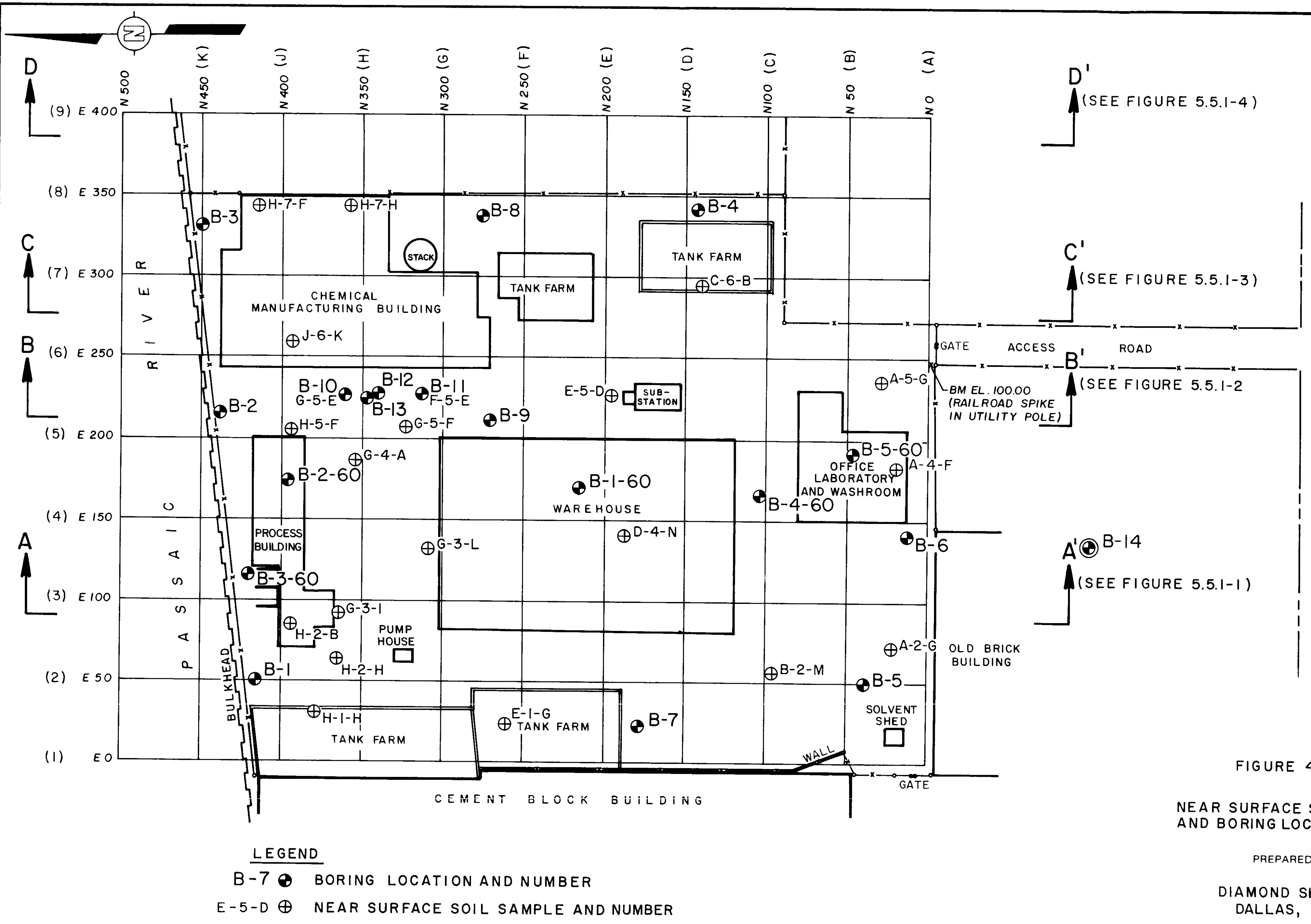
PREPARED FOR

DIAMOND, SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

"Do Not Scale This Drawing"



LEGEND

B-7 ● BORING LOCATION AND NUMBER

E-5-D ⊕ NEAR SURFACE SOIL SAMPLE AND NUMBER

SCALE
0 60 120 FEET

FIGURE 4.2.5-1

NEAR SURFACE SOIL SAMPLE
AND BORING LOCATION PLAN

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

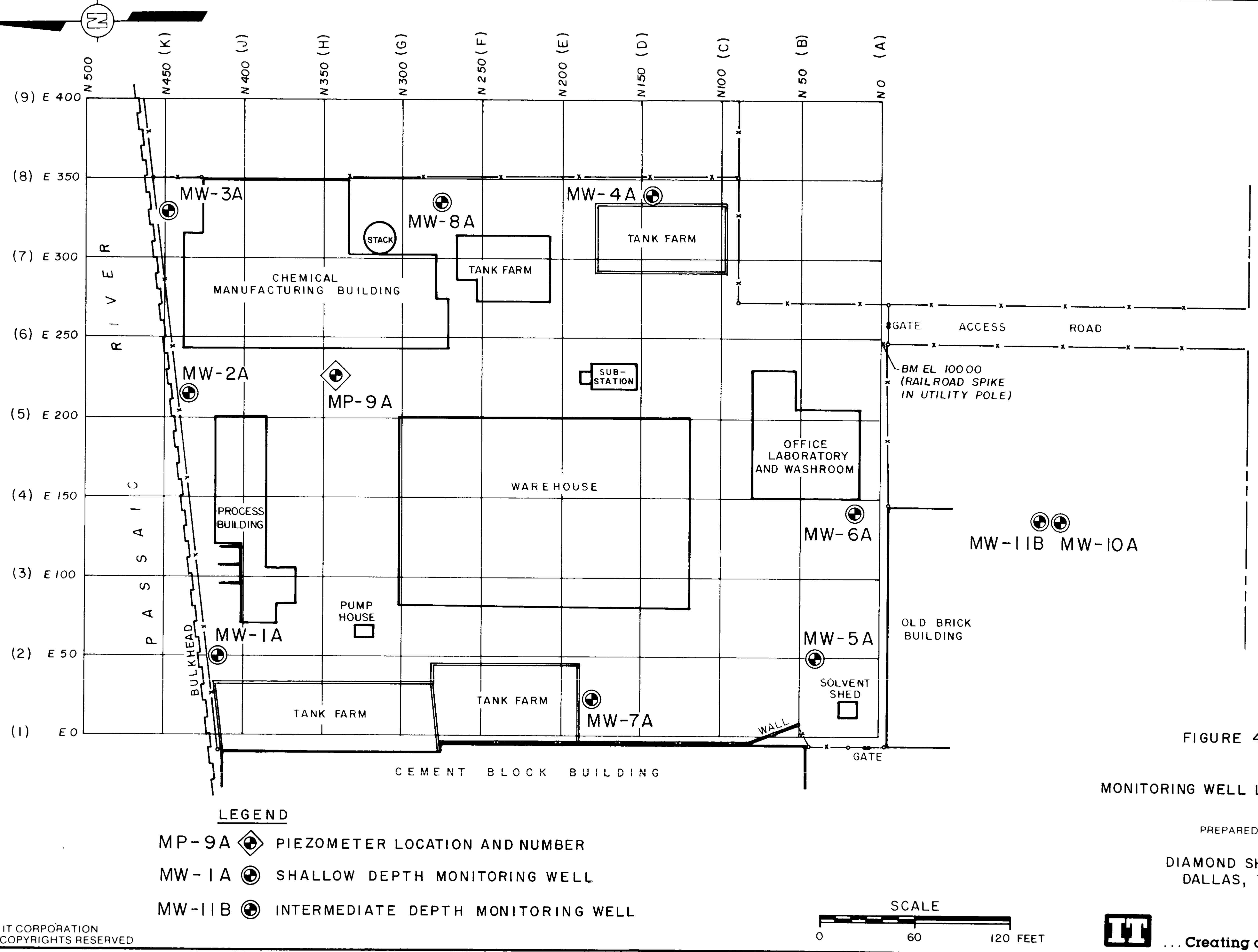
IT ... Creating a Safer Tomorrow

100% 2B ORG. 2B	DRAWN BY	RW 1-29-85	CHECKED BY APPROVED BY	TTO 2-15-85 DGE 2-15-85	DRAWING NUMBER 846248-B18

65380

Do Not Scale This Drawing

100%	IB	DRAWN BY	RW	CHECKED BY	JTO	2-15-85	DRAWING NUMBER 846248-B17
ORG	IB		1-29-85	APPROVED BY	DGE	2-15-85	



LEGEND

MP-9A ◈ PIEZOMETER LOCATION AND NUMBER

MW-1A ● SHALLOW DEPTH MONITORING WELL

MW-11B ● INTERMEDIATE DEPTH MONITORING WELL

FIGURE 4.2.6-1

MONITORING WELL LOCATION PLAN

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

DRAWING NUMBER 846248-A47

CHECKED BY

APPROVED BY

DRAWN BY J LOGRECO 2-12-85

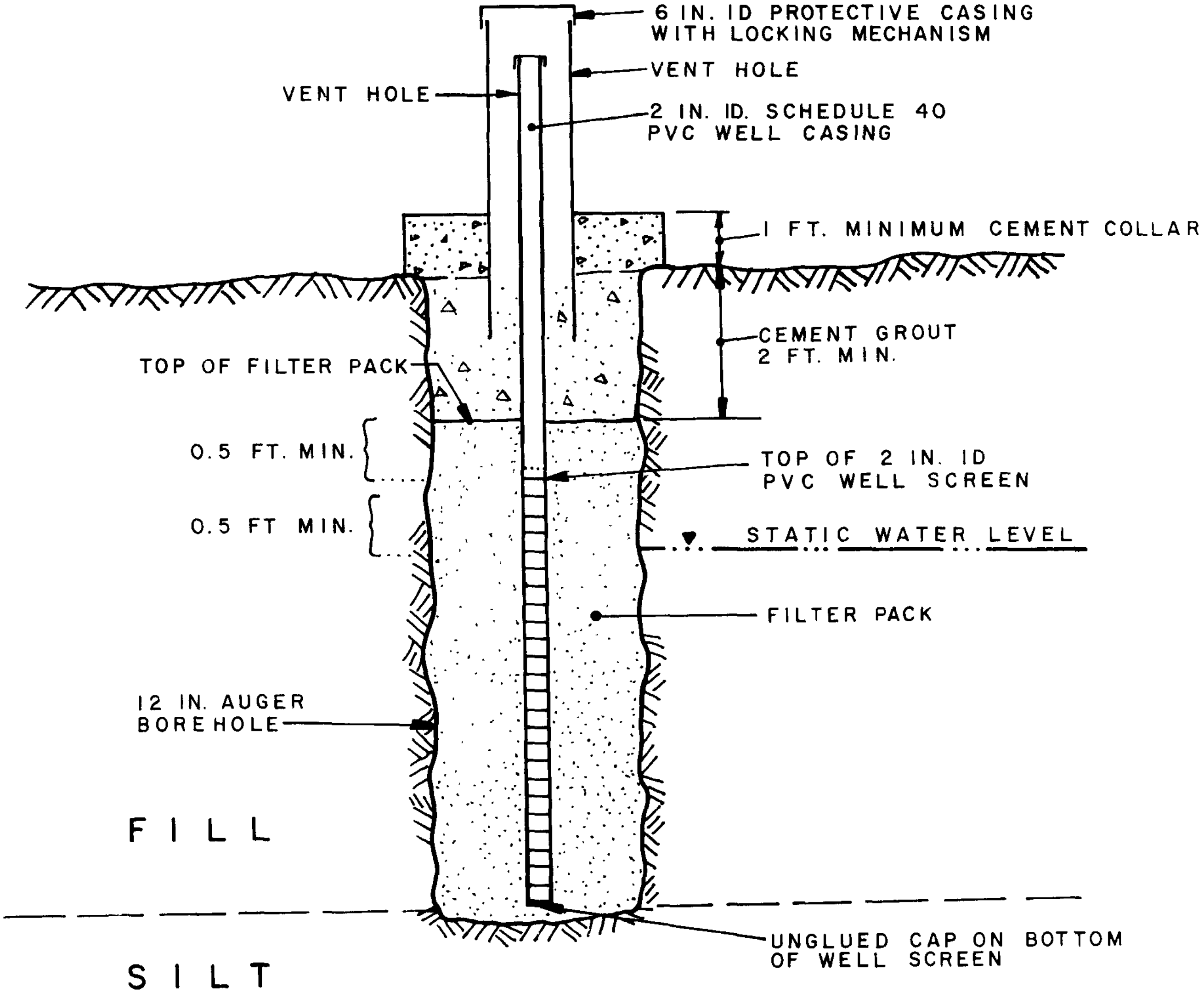


FIGURE 4.2.61-1

TYPICAL SHALLOW (A)
MONITORING WELL IN FILL

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

IT ... Creating a Safer Tomorrow

Do Not Scale This Drawing

DRAWING NUMBER 846248-A48

CHECKED BY

APPROVED BY

DRAWN BY D. Weick 2-11-85

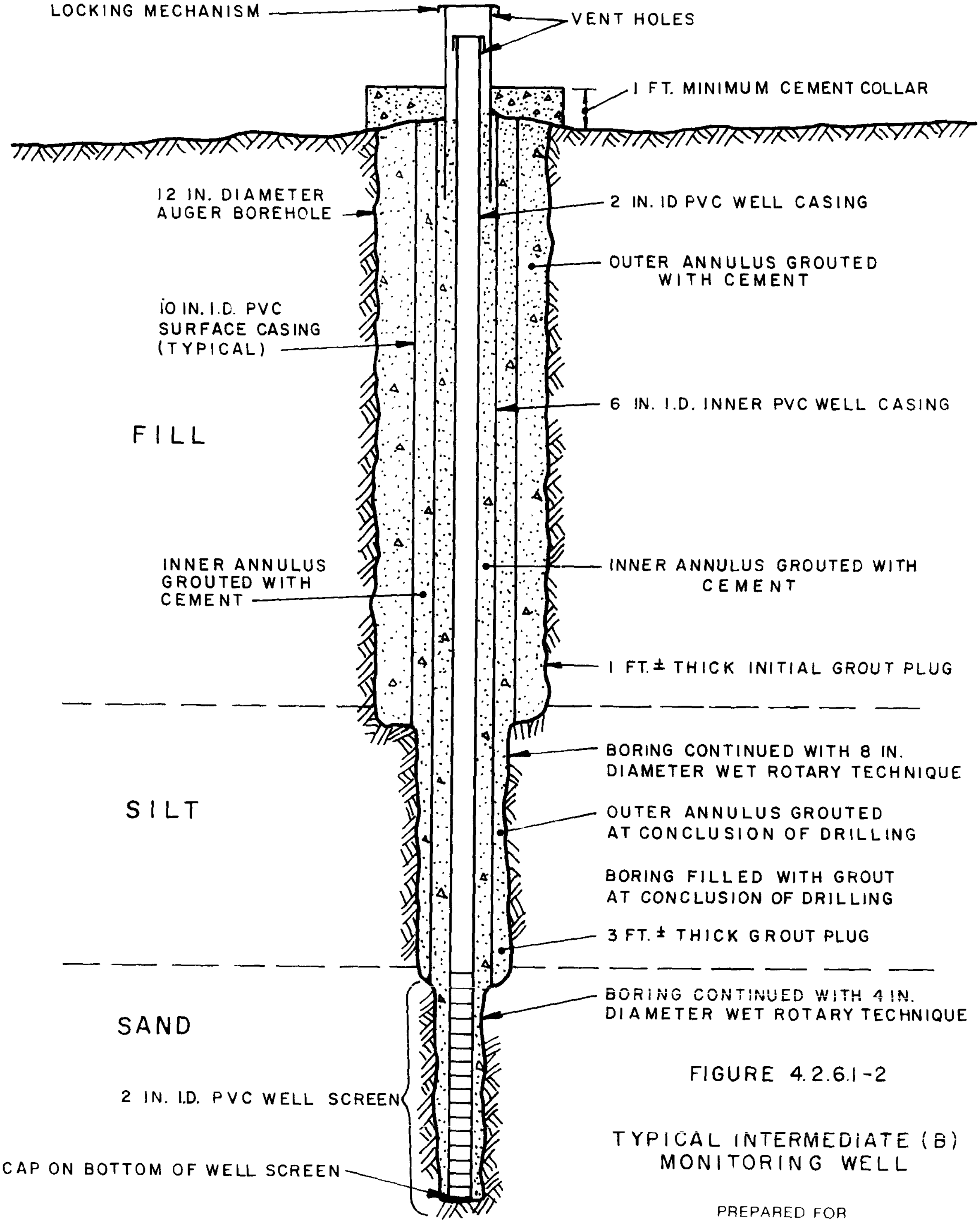


FIGURE 4.2.6.1-2

TYPICAL INTERMEDIATE (B)
MONITORING WELL

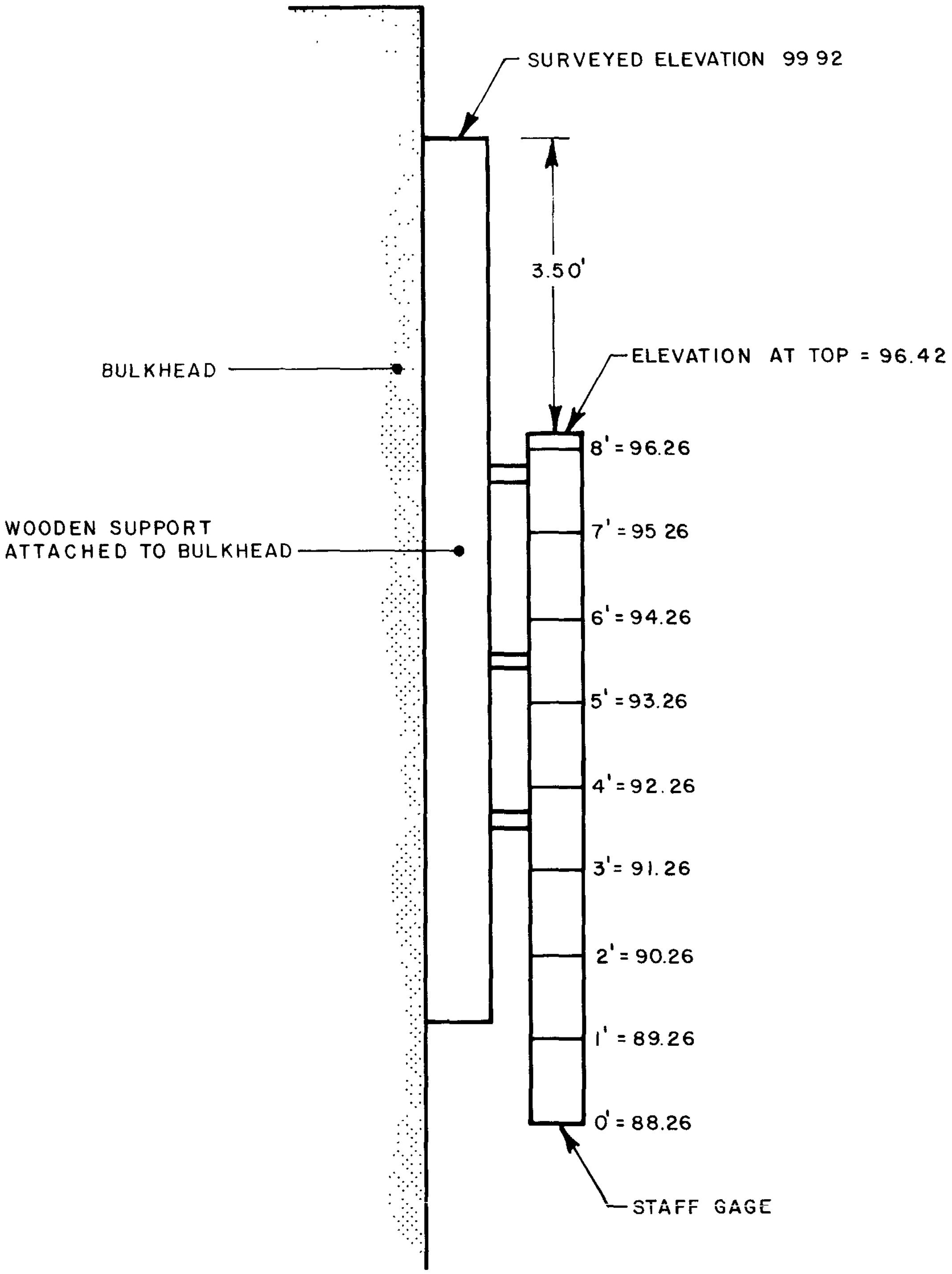
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

Do Not Scale This Drawing

IT ... Creating a Safer Tomorrow



NOTE:

ALL ELEVATIONS ARE WITH RESPECT TO SITE DATUM.

FIGURE 4.2.7.1-1

PASSAIC RIVER
STAFF GAGE

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

DRAWING NUMBER 846248-A46

CHECKED BY

APPROVED BY

RW

2-11-85

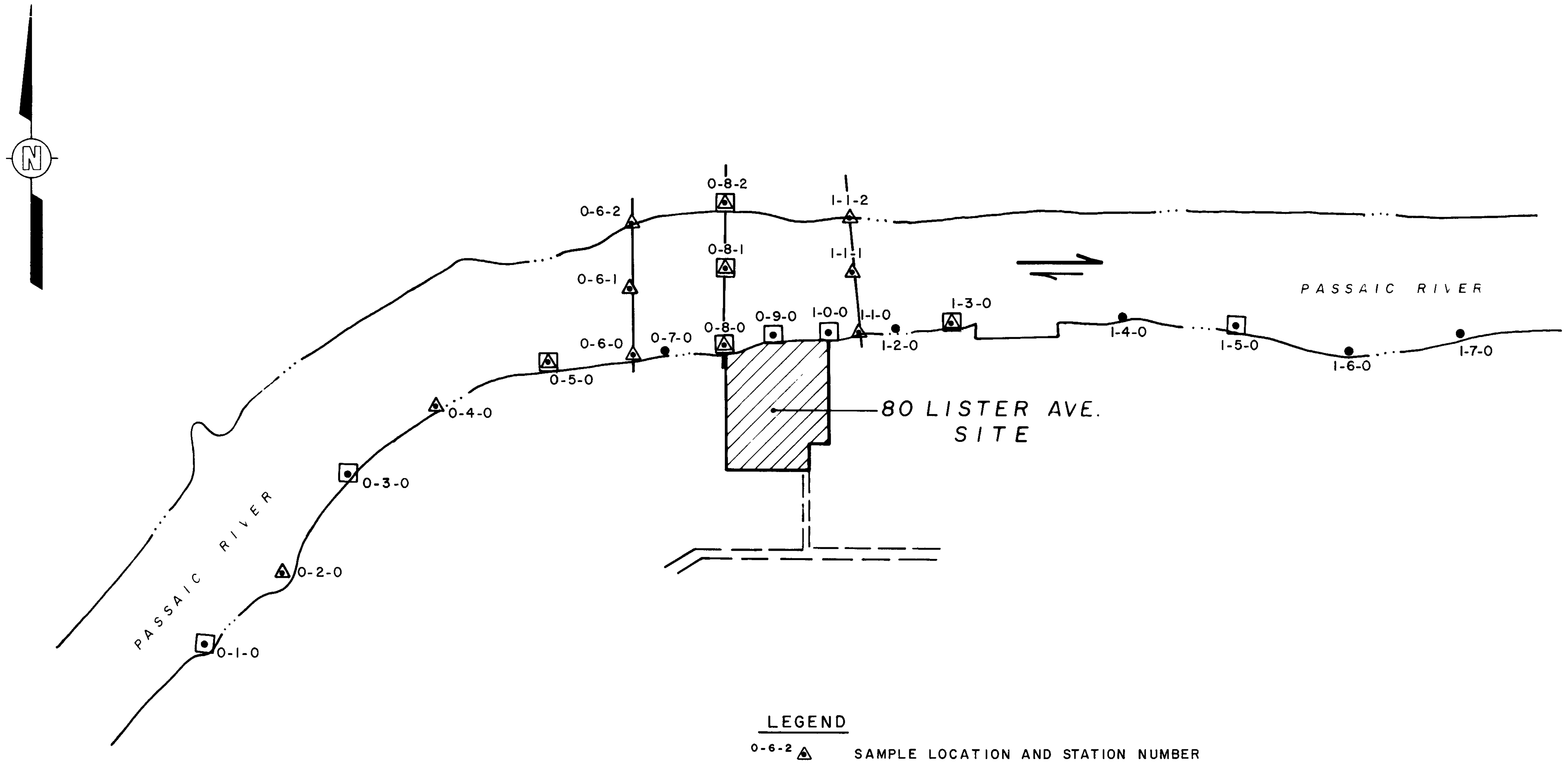
DRAWN BY

... Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

DRAWN BY	J. LOGRECO 1 · 28 · 85	CHECKED BY APPROVED BY	JTD DGE	2-15-85 2-15-85	DRAWING NUMBER	846243-B8



LEGEND

0-6-2 ◬ SAMPLE LOCATION AND STATION NUMBER

DIOXIN ANALYSES

- ● SAMPLE LOCATION, 0"-12" (10 SAMPLES)
- ◬ SAMPLE LOCATION, 0"-12" AND 12"-24" (26 SAMPLES)

PRIORTY POLLUTANT ANALYSES

- ⊡ SAMPLE LOCATION, 0"-12" (5 SAMPLES)
- ◬ SAMPLE LOCATION, 0"-12" AND 12"-24" (10 SAMPLES)

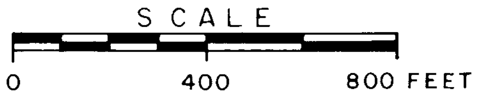


FIGURE 4.2.8-1

SEDIMENT SAMPLING LOCATIONS

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

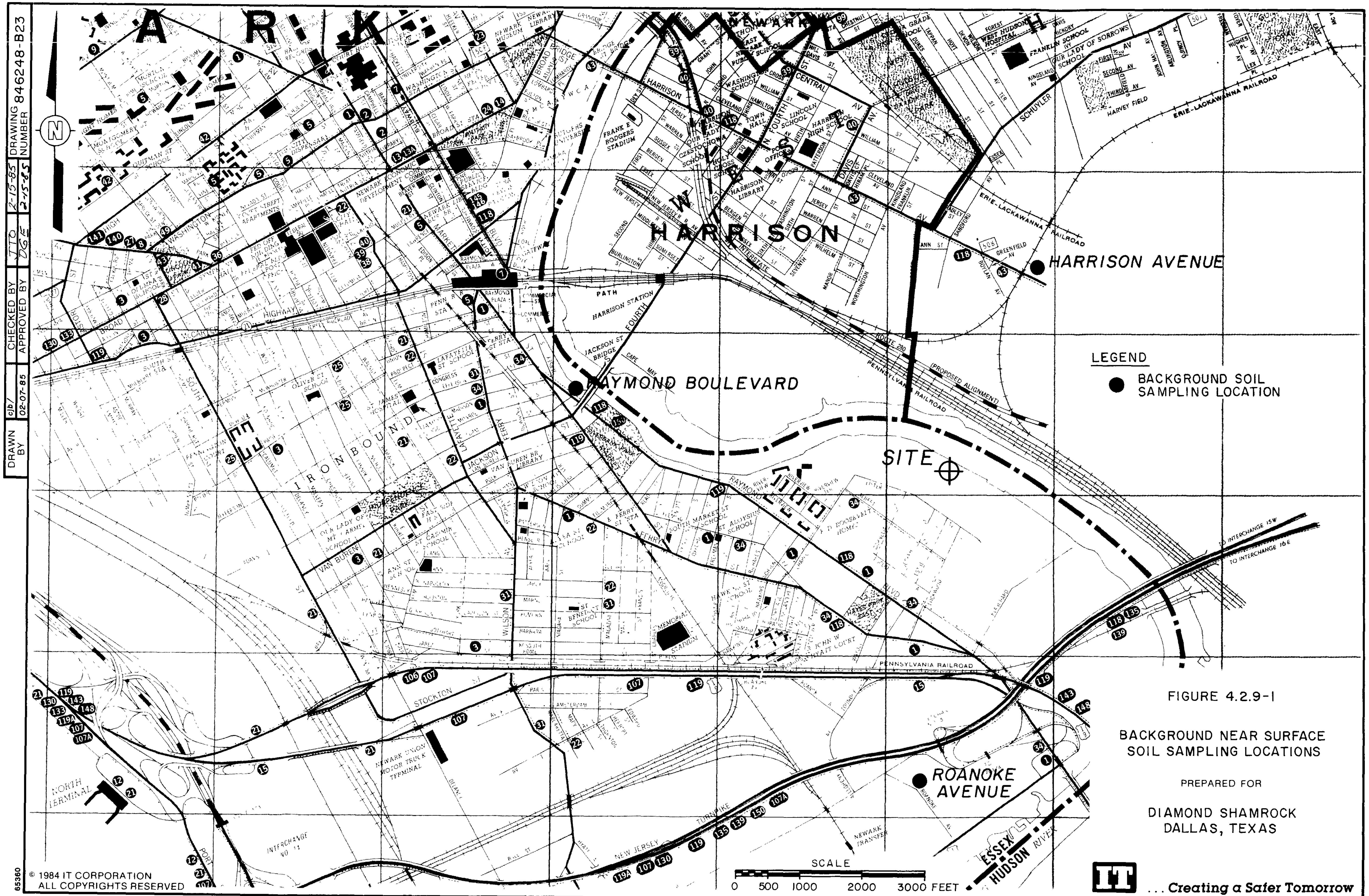


FIGURE 4.2.9-1

BACKGROUND NEAR SURFACE SOIL SAMPLING LOCATIONS

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

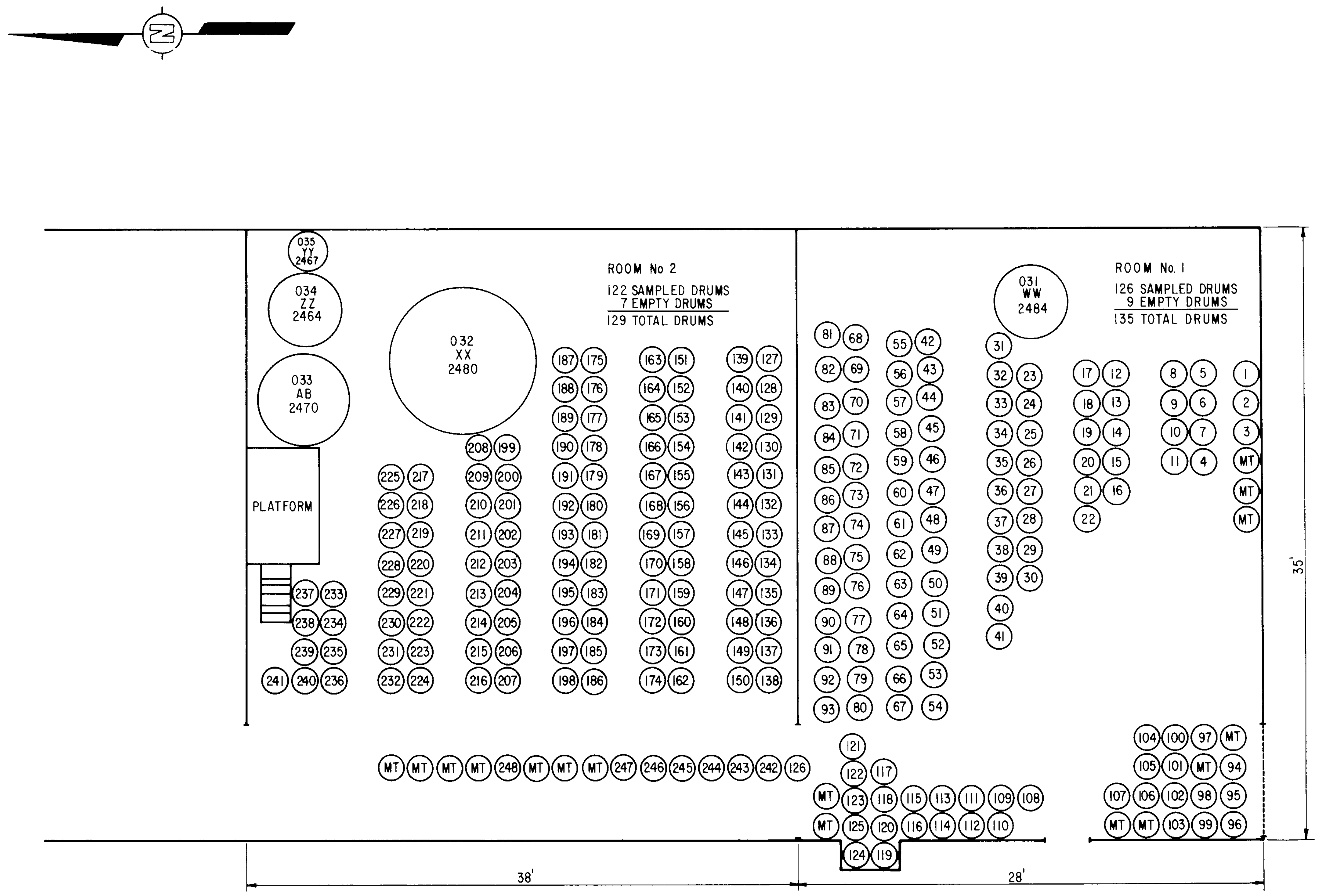
IT ...Creating a Safer Tomorrow

DRAWN BY	clb/	CHECKED BY	TTO	2-15-85	DRAWING NUMBER
	02-07-85	APPROVED BY	DGE	2-15-85	846248-B23

65360

"Do Not Scale This Drawing"

DRAWN BY	CJB	11-5-84	
CHECKED BY	JTO	2-15-85	DRAWING NUMBER 846248-B3
APPROVED BY	DGE	2-15-85	



NOTE:

FOR PLAN AND LOCATION OF CHEMICAL MANUFACTURING BUILDING, SEE FIGURE No. 4.2.3.2-4.

FIGURE 4.2.10-1

LOCATION OF DRUMS
CHEMICAL MANUFACTURING BUILDING
ROOMS 1 AND 2 - FIRST FLOOR

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

"Do Not Scale This Drawing"

NOTE:
FOR PLAN AND LOCATION OF
CHEMICAL MANUFACTURING
BUILDING, SEE FIGURE No. 4.2.3.2-4.

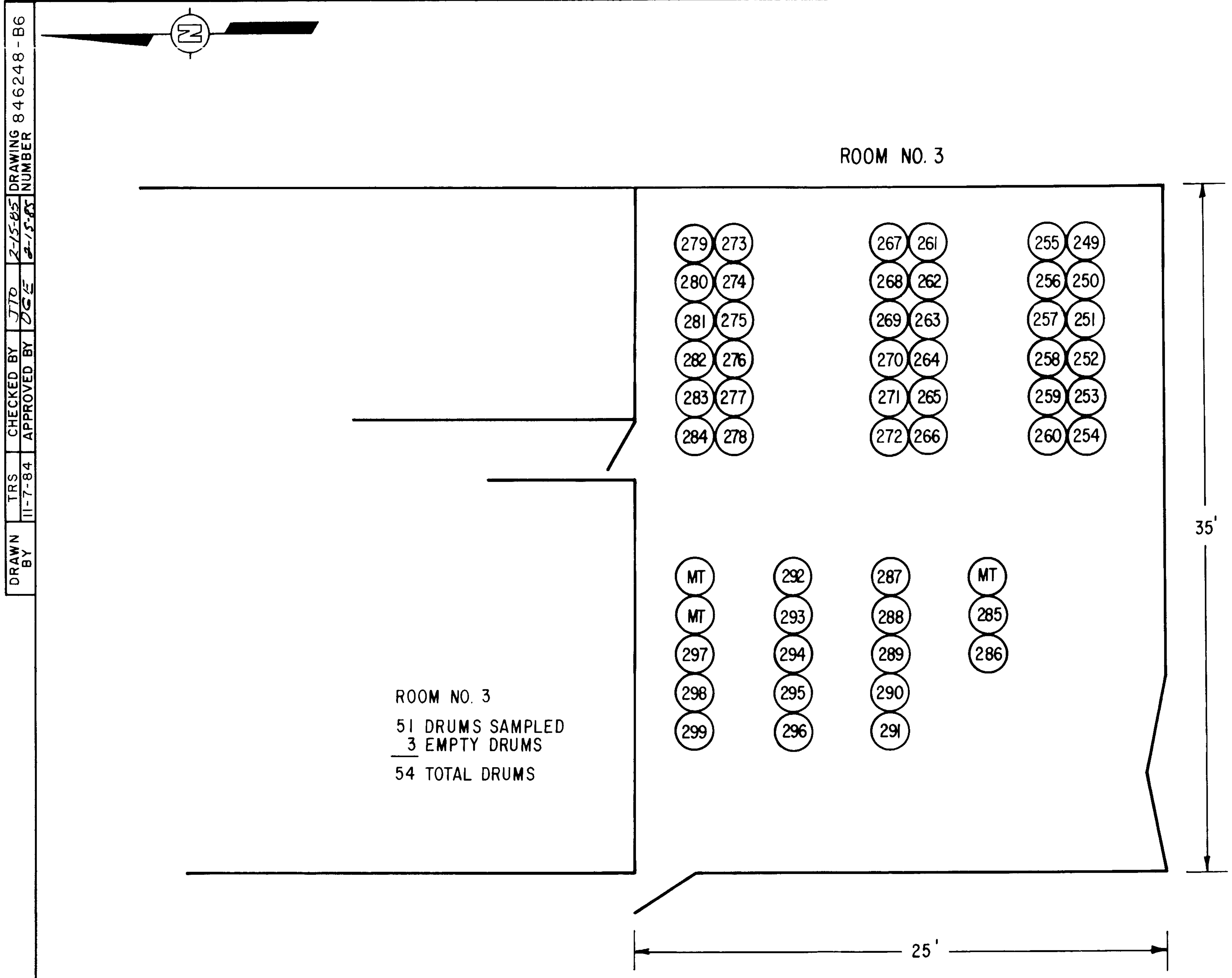


FIGURE 4.2.10-2

LOCATION OF DRUMS
CHEMICAL MANUFACTURING BUILDING
ROOM 3 - SECOND FLOOR

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

DRAWN BY	TRS	CHECKED BY	JTO	2-15-85
	11-7-84	APPROVED BY	DGE	2-15-85
DRAWING NUMBER 846248-B6				

65360

NOTE:

FOR PLAN AND LOCATION OF CHEMICAL MANUFACTURING BUILDING, SEE FIGURE No. 4.2.3.2-4.

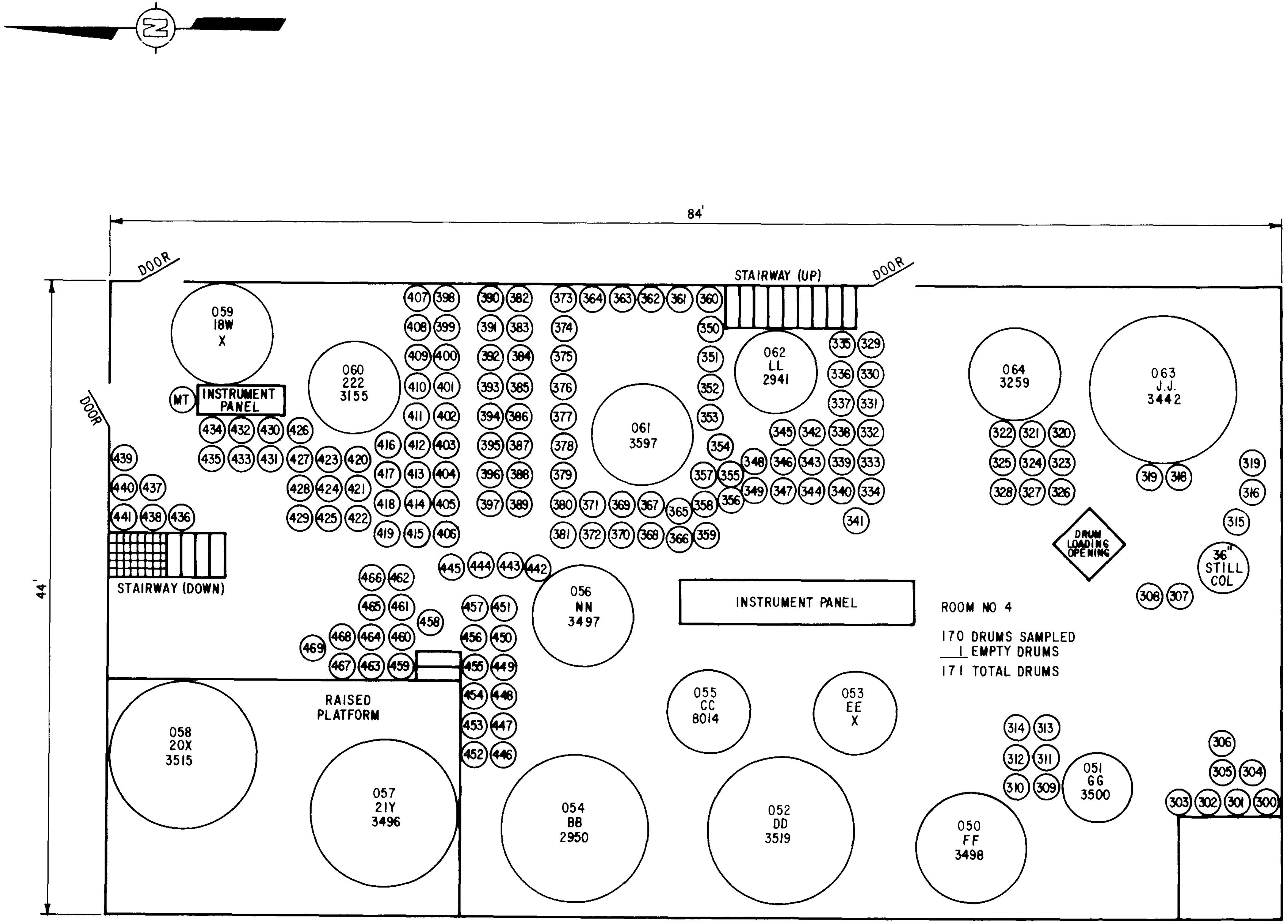


FIGURE 4.2.10-3

LOCATION OF DRUMS
CHEMICAL MANUFACTURING BUILDING
ROOM 4 - SECOND FLOOR

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

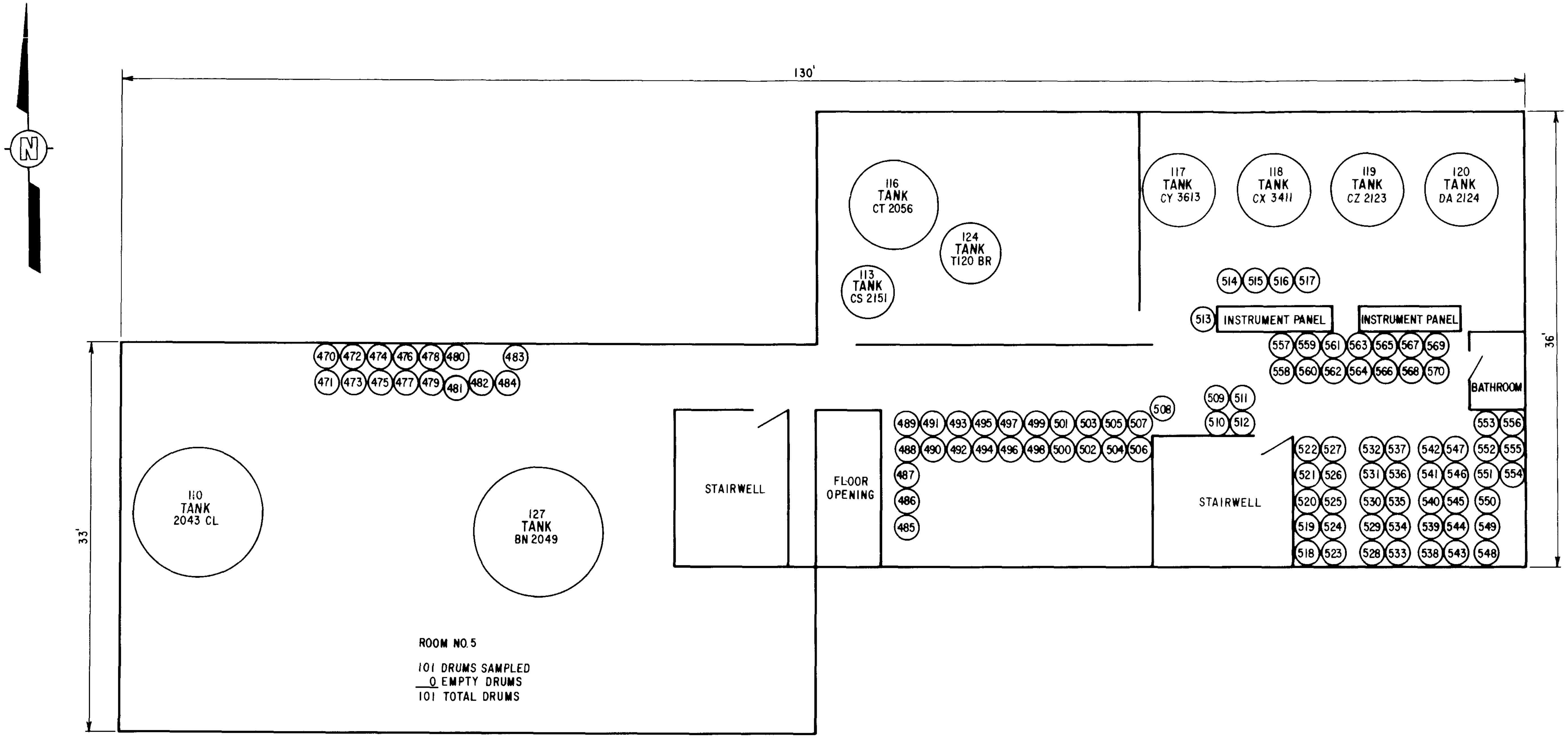
IT ... Creating a Safer Tomorrow

DRAWN BY	RW	11-7-84
CHECKED BY	JTD	2-15-85
APPROVED BY	DGE	2-15-85
DRAWING NUMBER	846248-B4	

65360

Do Not Scale This Drawing

DRAWN BY	RW	CHECKED BY	JTO	2-15-85	DRAWING NUMBER 846248 -- B5
	11-7-84	APPROVED BY	DGE	2-15-85	



NOTE:

FOR PLAN AND LOCATION OF PROCESS BUILDING, SEE FIGURE No. 4.2.3.2-4.

FIGURE 4.2.10-4

LOCATION OF DRUMS
PROCESS BUILDING
ROOM 5 - SECOND FLOOR

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

"Do Not Scale This Drawing"

5.0

5.0 DATA PRESENTATION

The results of the field investigation program and subsequent laboratory analytical testing are presented in the following subsections. The results include logs of borings and near-surface sample holes, hydraulic conductivities and ground water flow rates, and concentrations of priority pollutants and dioxin detected in buildings, soils, ground water and river sediments.

Of the 1540 samples collected, 877 were archived for possible future dioxin analysis. There were 532 dioxin analyses (a complete tabulation of the dioxin results is presented in Appendix C) and 122 priority pollutant analyses performed including QC, industrial hygiene and ambient air. The results of these analyses are summarized in tables and illustrated with figures presented herein. Complete laboratory analysis summaries and other supporting data are presented in appendices at the end of this report. Files of raw data as reported from the laboratories are being provided separately to NJDEP.

5.1 AMBIENT AIR

Ten sets of ambient air samples were subjected to detailed chemical analysis. As requested by the NJDEP, those sets of samples having the ten highest iron and manganese concentrations were analyzed. Table 5.1-1 presents the results of the inhalable particulate matter (IPM) filter analyses for iron and manganese (in total micrograms per filter), and indicates those sample sets chosen for detailed chemical analysis. One of the sample sets chosen corresponds to a one-in-six day sampling normally conducted by NJDEP. Five such NJDEP sampling days occurred during the site investigation. At the request of the NJDEP, the selected sample list was modified by substituting a set of samples corresponding to another NJDEP sampling period (September 21, 1984) for the originally selected October 8, 1984 set. The sample sets are identified in Table 5.1-1. The analytical results of the ambient air sampling are reported in Tables 5.1-2 through 5.1-7.

The observed concentrations of total suspended particulate matter (TSP), IPM and metals are presented in Table 5.1-2 for the ten days selected for analysis. The TSP concentrations ranged from 85 to 254 micrograms per cubic meter ($\mu g/m^3$) with five days recording concentrations in excess of 150 $\mu g/m^3$. The IPM concentrations ranged from 56 to 196 $\mu g/m^3$; the maximum value occurred on the same day (September 25) as the maximum TSP concentration. The concentration of all metals except iron were less than 1 $\mu g/m^3$ on all days. The iron concentrations ranged from 0.682 to 1.259 $\mu g/m^3$, with the maximum occurring on the day of maximum TSP and IPM concentrations.

On only two of the days chosen for analysis was any concentration of dioxin recorded, as shown in Table 5.1-3. The observed concentrations were 86 picograms per cubic meter (pg/m^3) on September 10 and 286 pg/m^3 on September 24. Vinyl chloride was found on only five of the ten days chosen for analysis, as illustrated in Table 5.1-4. The observed vinyl chloride concentrations ranged from 0.15 to 0.33 $\mu g/m^3$. Only nine samples were analyzed for volatile organic conpounds (VOC) because one sample was broken in shipment. The results of the VOC analyses are also presented in Table 5.1-4. Total VOC concentrations ranged from 71 to 182 $\mu g/m^3$.

The asbestos fiber counts were all less than 0.01 fibers per cubic centimeter, as shown in Table 5.1-5. The concentrations of pesticides and polynuclear aromatics (PNA) for the samples analyzed are provided in Tables 5.1-6 and 5.1-7, respectively. The observed pesticide and PNA concentrations are all less than their permissible exposure levels.

All air volumes utilized in calculation of concentrations reflect calibration corrections. Analytical results were used as prepared by the laboratory with adjustments for recoveries, breakthrough, or blanks.

Meteorological data were collected at the ambient air monitoring site throughout the sampling period. Data were also obtained from the weather station located at the Newark International Airport (approximately three miles southwest of the site) for the sampling period. These data include temperature, barometric pressure, sky cover, precipitation, and wind speed and direction. To date only wind direction data have been summarized. Figure 5.1-1 is a wind rose of the wind direction data collected at the site from September 7, 1984, through October 9, 1984. Figure 5.1-2 is a similar wind rose for the same period using data from National Weather Station (WSO) located at Newark Airport. Differences in the appearance of the two wind roses can be attributed to local topographic features affecting the wind flow patterns.

5.2 INDUSTRIAL HYGIENE

During the site investigation, a comprehensive industrial hygiene monitoring program was conducted so that the adequacy of the assigned worker protection could be evaluated and demonstrated. The results of the program are discussed below.

5.2.1 Atmospheric Samples for Dioxin

Table 5.2.1-1 presents the results of all dioxin related industrial hygiene monitoring; of these, 43 were atmospheric samples. For seven of the atmospheric samples, resultant concentrations were greater than the permissible exposure level (PEL) of 0.5 nanograms per cubic meter of air (ng/m^3). None of the 24 blank samples indicated detectable levels of dioxin. The seven samples are associated with four specific operations. The operations and the actions taken were:

- Chip sampling of outside walls produced airborne concentrations of dioxin of 0.74 ng/m^3 and 1.23 ng/m^3 on September 14 and 18, 1984. All other monitoring during chip sampling resulted in concentrations below detectable levels. Because of the two results above the PEL, all future chip sampling will require the use of self-contained breathing apparatus (SCBA).

- A sample with a concentration of 26.3 ng/m^3 was obtained from a tank in the process building. However, the worker entering the tank had already been required to wear an SCBA because it was anticipated that the exposure level could be above the PEL.

- In the area where the drill rigs were decontaminated, concentrations of 98.9 ng/m^3 and 8.9 ng/m^3 were recorded. Again, concentrations above the PEL had been anticipated and SCBA's were used.

- During soil sampling, concentrations of 1.75 and 1.71 ng/m^3 were recorded on October 22, 1984. This was a one-day task at the end of the project in an area where high concentrations were expected; SCBA's were required for this reason.

Because of variations in air volumes sampled and background interferences, it was not always possible to reach a method detection level less than 0.5 ng/m^3 for dioxin. The detection level achieved is shown in parenthesis for the ND (none detected) results in Table 5.2.1-1. However, this level was reached a sufficient number of times (19 out of 36 airborne results reported as ND) to provide the basis for sound decisions concerning respiratory protection.

5.2.2 Wipe and Water Samples for Dioxin

Fourteen industrial hygiene wipe samples (including three blanks) for dioxin analysis were collected. Of these, ten were obtained from defined spatial areas so that area concentrations in ng/m^2 could be determined. Only one of the 10 samples exceeded the stated allowable level of 100 ng/m^2. This result was 124 ng/m^2 on an air hose after decontamination. Because this dioxin concentration could not be reduced to the acceptable level, the hose was left on site for future disposition. One wipe sample was taken from an undefined area, and is reported as 52.2 ng/wipe. One water sample taken from the final rinse tub of the decontamination line was analyzed; dioxin was detected at 0.02 ppb. The observed levels for the wipe and water monitoring samples were deemed acceptable for continuation of existing operations.

5.2.3 Atmospheric Samples for Volatile Organics, Semi-Volatile Organics, Alcohols, 2,4,5-T, 2,4-D, Asbestos, and Sulfuric Acid

A total of 24 samples were obtained for analysis of the above compounds. A summary of results for 2,4,5-T, 2,4-D, asbestos, sulfuric acid and all volatile and semivolatile compounds for which positive results were obtained is presented in Table 5.2.3-1. All positive results observed were of sufficiently low concentration not to be of concern.

5.2.4 Heat Stress

A Reuter Stokes Heat Stress Monitor was used on 11 days during September and October, 1984, due to the potential for heat stress related illness on these days. Results were compared to the American Conference of Governmental Industrial Hygienists recommended threshold limit value (TLV). A work-rest regimen was established at those times when the TLV was exceeded.

5.2.5 Noise Monitoring

The most significant source of noise during the site investigation was the drilling rigs. Accordingly, noise measurements were taken at the drilling operations on October 17, 1984. Measurements ranged from below 80 decibels (dBA) to 84 dBA. The permissible exposure limit is 85 dBA for hearing protection requirements and 90 dBA for engineering controls. These limits were not exceeded.

5.2.6 General Health and Safety

The procedures presented in the Work Plan were followed. All personnel entering the site were given one to two days of site specific training, depending on the amount of health and safety training previously received. All ITC employees and subcontractor employees were required to have medical examinations prior to entering the contamination zone. All personnel on site were required to wear the protective equipment prescribed in the Work Plan.

5.3 BUILDINGS AND STRUCTURES

Building and structures were sampled as described in the Subsection 4.2.3 of this report. Wipe, chip, and bulk samples were collected to evaluate the buildings and structures for potential contamination. Wipe samples were collected from coated floors, walls, fixtures, and air ducts; chip samples were collected whenever possible from exposed concrete floors and building exterior or brick surfaces. All wipe and chip samples were analyzed for dioxin only. Bulk samples were taken to determine the possible presence of asbestos in insulation and other building materials. Selected bulk samples were also analyzed for dioxin.

Figure 4.2.3-1 is a plot of the site identifying the major buildings and structures. A total of 142 samples were collected from the buildings and structures and analyzed to evaluate the nature and extent of contamination. For one wipe sample (1206-0028-W-L) there was no recovery of the internal standards, and thus no result is reported. One asbestos sample (4100-0594-B-C) was lost in transit.

Table 5.3-1 is a summary of the asbestos sample results, and Table 5.3-2 presents specific results by location. Table 5.3-3 summarizes the dioxin results for the wipe, chip, and bulk samples.

Table 5.3-4 presents the dioxin reanalysis results for wipes and chips. Wipes were completely consumed in the initial sample preparation; therefore all reanalyses required were dilutions of the original extract. Chip samples were re-extracted as one gram samples. Because varying sizes of chips have different exposed surface areas, results typically varied. Reanalysis results are reported in all cases. In general, though, the initial and reanalysis results are of the same order of magnitude and are not considered significantly different.

5.3.1 Office and Laboratory Building

Figures 4.2.3.2-1 and 4.2.3.2-2 show the first- and second-story floor plans of the office and laboratory building and the room designations. Table 5.3.1-1 presents the dioxin analysis results for wipe and chip samples collected in the office and laboratory building. Of the 39 samples collected in this building, dioxin was not detected in seven and one sample was voided. Dioxin concentrations of the first floor wipe samples ranged from 38 to 1,100 ng/m^2. Dioxin concentrations of first floor chip samples ranged from 2.0 to 69.3 ppb. Fifteen of 15 first-floor samples were identified as containing dioxin. Dioxin concentrations of the wipe samples taken on the second floor ranged from 10 to 14,000 ng/m^2 with 11 of the 11 valid samples having dioxin identified. The dioxin concentrations of chip samples from the exterior of the building ranged from 0.57 to 2.4 ppb with 5 of 11 samples having dioxin identified. One exterior wipe sample had a dioxin concentration of 168 ng/m^2; the other showed no dioxin present.

5.3.2 Warehouse

Figure 4.2.3.2-3 shows the floor plan of the warehouse with the assigned room designations. Table 5.3.2-1 provides the dioxin analysis results for wipe and chip samples collected in the warehouse. Of the 24 samples collected, 21 samples showed detectable levels of dioxin. The dioxin concentrations of interior wipe and chip samples ranged from 130 to 19,000 ng/m^2 and from 48.7 to 192 ppb, respectively. All 11 interior samples had positive dioxin results The dioxin concentrations of exterior chip samples ranged from 1.0 to 16.5 ppb with 9 of 12 samples having positive results. The single exterior wipe sample showed dioxin present at 13 ng/m^2.

5.3.3 Manufacturing Building

Table 5.3.3-1 summarizes the dioxin analysis results for all wipe and chip samples collected from the manufacturing building. Positive dioxin results were obtained for 27 of the 28 samples collected. The dioxin concentrations of interior chip samples ranged from 1.1 to 1,280 ppb; 14 of 14 samples collected showed positive results. The concentration range for interior wipe samples was 233 to 7,000 ng/m^2, with all four samples having dioxin identified. The dioxin concentrations of exterior chip samples ranged from 0.93 to 203 ppb, with 9 of 9 samples having positive results. Dioxin was not detected in the single exterior wipe sample.

5.3.4 Process Building

Table 5.3.4-1 summarizes the dioxin analysis results for wipe, chip, and bulk samples taken from the process building. All 29 samples collected had identifiable dioxin concentrations. The dioxin levels detected for the 12 interior wipe samples ranged from 60 to 41,600 ng/m^2. The dioxin concentrations of the three interior chip samples ranged from 43.2 to 696 ppb. Dioxin concentrations for the seven exterior chip samples ranged from 2.7 to 1,580 ppb. The two exterior wipe samples showed dioxin levels of 6.4 and 12 ng/m^2. The bulk samples collected ranged from 3.0 to 128 ppb with five of five samples having positive dioxin results.

5.3.5 Other Structures

The dioxin analysis results for chip and bulk samples collected from the stack, solvent shed, and the pump house are presented in Table 5.3.5-1. All six chip samples collected had detectable levels of dioxin ranging from 1.2 to 50.0 ppb. Dioxin was detected at 0.17 ppb in the single bulk sample collected.

5.3.6 Tanks

Tank samples were taken from chemical process vessels and outside storage tanks. In total, 140 tank samples were collected and 12 were designated for dioxin analysis. Appendix D lists the tank samples collected. Samples not selected for analysis are archived at the Directors Drive laboratory.

Table 5.3.6-1 presents the dioxin results for the 12 tank samples analyzed, of which nine (75 percent) had positive dioxin results. Three samples showed no recovery of the internal and surrogate standards: sample 7112-1523-N-L was a liquid, and the total volume collected was used in the initial analysis making reanalysis impossible; samples 7041-1192-N-L and 7037-1206-N-L were determined not to be analyzable after three separate attempts failed to achieve measurable recovery. Therefore, no results are reported for these three samples.

The initial result for sample 7129-1548-N-L was out of the dioxin calibration range and reanalysis of a one gram aliquot was performed. Other samples were initially analyzed as one gram aliquots; some reanalyses as extract dilutions were required. Table 5.3.6-2 summarizes the reanalysis results. These are reported in all cases because they are more representative of the sample aliquot analyzed.

5.4 SEWERS AND SUMPS

Sewer and sump samples were taken as described in the Subsection 4.2.4. Four sewer and eight sump samples were collected for dioxin analysis. Figure 4.2.4-1 indicates the sewer and sump locations on site. Table 5.4-1 summarizes the dioxin concentrations found in these samples and Table 5.4-2 presents the dioxin results for each specific location sampled.

Table 5.4-3 provides a summary of dioxin reanalysis results for the sewer and sump samples. Of the 12 samples taken, nine (75 percent) required reanalyis because the initial result was out of the dioxin calibration range. Because of the nonhomogeneity of the sludge samples collected and significant instrumental detector saturation, results for the one gram reanalysis and dilutions varied from the original analysis results. The reanalysis results are reported herein, because the analytical results are more representative of the aliquot analyzed. However, there are problems inherent with smaller sample size being representative of the overall population. Potentially a higher percentage concentration will be found in smaller samples than would be found in the entire population and this would be more evident in inhomogenous matrices such as solids. However, all results obtained were of the same order of magnitude and no significant errors are apparent.

5.5 SOILS

The results of the subsurface soil investigation at the site are presented in the following subsections. These results include the subsurface lithology developed from the geotechnical boring logs (Appendix B) and the analytical laboratory data.

5.5.1 Subsurface Lithology

Fourteen geotechnical borings were drilled on or near the site (Figure 4.2.5-1). Split-spoon and Shelby tube samples from the borings were logged according to both the USCS and Burmister classification system. Information from five earlier borings was also used to aid in the definition of site subsurface conditions. Subsurface cross sections have been developed from the boring log data.

The plan locations of the cross sections are shown in Figure 4.2.5-1. Cross sections A-A', B-B', C-C', and D-D' are presented in Figures 5.5.1-1 through 5.5.1-4. As can be seen from the figures, fill ranging in thickness from 8 to 15 feet is present at the surface. The fill is underlain by silt which is in turn underlain by glacio-fluvial sands. On the southern portion of the site, the silt consists of an upper organic layer and a lower layer with lenses of clay and sand. On the northern portion of the site, the organic layer is not found and was probably removed by the Passaic River. Although bedrock was not encountered in any site borings, it is estimated to lie about 100 feet below the surface and is presumed to be interbedded sandstone and shale of the Brunswick Formation. Standard penetration resistance (blowcount) data are provided on the subsurface cross sections.

5.5.2 Analytical Laboratory Testing

Near-surface and boring soil samples were collected as described in Subsection 4.2.5. Each sample was uniquely identified in accordance with the protocol described in Subsection 4.1.2 and presented in Appendix A. The elevation codes used to designate samples at a specific location are schematically represented in Figure 5.5.2-1. Samples in the 100 series were taken in the fill; the 200 series designates the silt layer; and the 300 series samples were obtained from the glaciofluvial sand underlying the silt.

Near-surface soil samples were obtained to a depth of 60 inches. Samples from depth intervals of zero to 6 inches, 6 to 12 inches, and 12 to 24 inches were collected for the chemical analyses designated in the Work Plan. Below a depth of 24 inches, near-surface locations were continuously sampled at 12-inch intervals to a depth of 60 inches. Chemical analyses were not performed on samples from 24 to 60 inches as part of the current site investigation; however, the samples have been archived at the Directors Drive laboratory for possible future analyses . It is noted that prescribed holding times preclude future analysis for all parameters except dioxin. The archived near-surface soil samples are provided in Appendix E.

Boring soil samples were obtained from the silt layer. In accordance with the Work Plan, the samples were composited from Shelby tubes. To fully exploit the opportunity to collect additional near surface soil samples, the boring sampling program was expanded to include samples from zero to 24 inches in depth in increments of zero to 6 inches, 6 to 12 inches, and 12 to 24 inches.

Table 5.5.2-1 presents the analytical program conducted for the near-surface and boring soil samples. Chemical analysis was not performed for samples obtained below the silt layer.

Boring samples in the fill zone have been archived at the site. Aliquots of each sample were also taken for possible future dioxin analysis, and are archived at the Directors Drive laboratory. In the silt zone, dioxin samples were composited from the top and bottom of Shelby tubes for archiving at the ITC Directors Drive laboratory. Shelby tubes were sealed and archived at the site. Appendix E documents the boring soil samples that were archived.

5.5.2.1 Near-Surface Soil Samples

Near-surface soil samples were collected at 21 locations on the site. Six samples were collected at each of 14 locations; at seven locations, refusal occurred at depths of 36 to 48 inches which resulted in 11 samples not being collected for archive. A total 115 near-surface soil samples were collected and are listed in Table 5.5.2.1-1. Appendix E contains summaries of the quantitative analytical results (organic priority pollutant analyses and method detection levels) for each, including summaries of the results of the 40 extraneous peak searches.

Of the 63 near-surface soil samples analyzed for dioxin, all had identifiable dioxin concentrations. For 22 of the 63 samples (35 percent) reanalysis of smaller sample aliquots (one gram) or dilutions were required to provide results in the instrumental calibration range. Table 5.5.2.1-2 is a presentation of the samples reanalyzed, the corrective action taken, and the initial and reanalysis results. The reanalysis was performed using one-gram samples aliquots versus the ten-gram sample size of the initial analysis. Three of the one-gram analyses required further reduction (as noted in Table 5.5.2.1-2) to provide analysis results in the instrumental calibration range. Because of significant instrumental detector saturation, the one-gram samples generally yield higher results than the ten-gram samples, as expected. Four of the one-gram samples did provide results lower than the initial analysis; this can most likely be attributed to sample inhomogeneity. However, the results are the same order of magnitude and the differences are not considered significant. In general, despite the stated difficulties associated with reanalysis, the results are considered more reliable than the initial analysis, and are reported for all samples where reanalysis was performed.

Table 5.5.2.1-3 summarizes the near-surface soil sample dioxin results by sample location and depth. Figures 5.5.2.1-1 through 5.5.2.1-3 present the dioxin results at depth intervals of zero to six inches, six to 12 inches, and 12 to 24 inches, respectively.

Priority pollutants were defined as the 157 compounds in the acid/base/neutral (semi-volatile), volatile organics, pesticides and PCB, herbicides, metals, total cyanide, and total phenol analyses plus the 40 extraneous peak searches. Forty-two near-surface soil samples were analyzed for priority pollutants. Table 5.5.2.1-4 presents the organic priority pollutant analysis levels and dilution factors applied to these samples. Reference is made to Appendix E for the definition of levels, and for the complete quantitative results.

Table 5.5.2.1-5 summarizes the detected base/neutral and acid organic compounds identified in the near-surface soil samples. Of the 69 semi-volatile compounds, 28 (41 percent) were identified one or more times in the depth intervals of zero to 6 and 12 to 24 inches. At zero to 6 inches, 24 compounds were identified. For 12 to 24 inches, 26 compounds were identified.

A summary of the detected volatile organic compounds in the near-surface soil samples is presented in Table 5.5.2.1-6. Of the 38 volatile organic compounds, 13 (34 percent) were identified one or more times. Methylene chloride and acetone were identified most frequently of the 13 compounds identified (42 of 42 and 28 of 42 samples, respectively). However, these concentrations are typically attributable to background levels due to handling either during collection, shipping, or in the laboratory. Higher levels are indicative of medium level analysis which significantly increases the detection limit. The relative analysis levels must be considered when evaluating the data in Appendix E.

Excluding methylene chloride and acetone values at zero to six inches, five compounds were identified; at the 12- to 24-inch depth interval, 11 compounds were identified.

For convenience of presentation, a summary of the detected herbicides, pesticides, and PCB's in the near-surface soil samples is given in Table 5.5.2.1-7. Of the 35 herbicide, pesticide, and PCB compounds, seven (20 percent) were identified one or more times.

A summary of the detected inorganic parameters (13 metals, total cyanide and total phenols) in the near-surface soils is presented in Table 5.5.2.1-8. Of the 13 metals, 12 (92 percent) were identified one or more times. Thallium was not identified in the near-surface samples. Nineteen near-surface soil sample locations had positive cyanide results. Positive results for total phenols were obtained for 20 of the zero- to 6-inch samples and 21 of the 12- to 24-inch samples.

For presentation purposes, relative concentrations of selected semi-volatile priority pollutants, and herbicides and pesticides are presented in Figures 5.5.2.1-4 through 5.5.2.1-7. These compounds were selected based on the frequency with which they were identified on site, their relationship to the site operations and frequency of identification in the off-site background samples. Quantitative results for these compounds were summed and relative ranges were arbitrarily established based on these values. The semi-volatile compounds selected for plotting were 2,4,6-TCP, 2,4-DCP, 2,4,5-TCP, and hexachlorobenzene. The compounds selected for the herbicides and pesticides were DDT, DDD, DDE, dalapon, 2,4-D, and 2,4,5-T. The values established for the depth intervals of zero to 6 and 12 to 24 inches from both the near-surface soils and boring soil samples are presented in the figures.

5.5.2.2 Boring Soil Samples

Boring soil samples were collected at thirteen locations on site. Five samples were obtained for designated analyses at each of seven locations. At Boring B-2, a silt sample was not recovered, resulting in only four samples at that location. Table 5.5.2-1 indicates the designated chemical analyses for the boring soil samples and Table 5.5.2.2-1 summarizes the samples collected. Appendix E contains an inventory of the 124 samples archived for geotechnical purposes and possible future dioxin analysis. Also, Appendix E provides a summary of all quantitative analytical results and the results of the 40 extraneous peak searches for the boring soil samples.

Of the 39 boring soil samples analyzed for dioxin, 35 (90 percent) samples had identifiable dioxin concentrations. For nine of the 39 (23 percent) samples, reanalysis of smaller sample aliquots (1 gram) or dilutions were required to yield results within the instrumental calibration range. Table 5.5.2.2-2 presents a summary of the samples reanalyzed, the corrective actions taken, and the initial and reanalysis results. One one-gram sample required further dilution to produce results within the instrumental calibration range. Due to instrumental saturation and the inhomogenity of soil samples, the reanalysis values increased as expected. In general, the values were of the same order of magnitude and reanalysis values were used for reporting purposes because they were more reliable than the initial analysis.

A summary of the dioxin results for the boring soil samples by sample location and depth is presented in Table 5.5.2.2-3. The results of dioxin analyses are also shown on the site cross sections in Figures 5.5.1-1 through 5.5.1-4. At depths of zero to 6 inches, the dioxin concentrations ranged from 19.7 ppb to 2700 ppb. At 6 to 12 inches, the dioxin concentrations ranged from 7.5 ppb to 3510 ppb, and at 12 to 24 inches, the dioxin concentration ranged from 4.7 ppb to 830 ppb. Samples from directly above the silt (Elevation Code 109) had dioxin concentrations ranging from 0.36 ppb to 71.8 ppb, with one of eight samples having no detectable dioxin. Samples from the silt zone (Elevation Code 201) had dioxin concentrations ranging from 0.49 ppb to 2.8 ppb with three of seven samples not having detectable concentrations of dioxin. Figures 5.5.2.2-1 and 5.5.2.2-2 present the results of the dioxin analyses for samples taken in the silt layer and immediately above.

Priority pollutants were defined as 157 compounds in the acid/base/neutral organics (semi-volatile), volatile organics, pesticides, and PCB's, herbicides, metals, total cyanides, total phenol analyses, plus the 40 extraneous peak searches. Twenty-four boring soil samples above the silt were analyzed for priority pollutants, but samples in the silt layer were not. Table 5.5.2.2-4 presents the boring soil sample organic priority pollutant analysis levels and dilution factors that were utilized in the analyses. Complete quantitative results for each sample are provided in Appendix E.

A summary of the detected base/neutral and acid organic compounds identified in the boring soil samples is provided in Table 5.5.2.2-5. Of the 69 semi-volatile compounds, 27 (39 percent) were identified one or more times in the samples from zero to 6 inches, 12 to 24 inches or the above silt. At zero to 6 inches, 20 compounds were identified; at 12 to 24 inches, 27 compounds were identified. In the soil samples taken from above the silt (Elevation Code 109), 17 compounds were observed.

The detected volatile organic compounds in the boring soil samples are summarized in Table 5.5.2.2-6. Of the 38 volatile organic compounds, 10 (26 percent) were identified one or more times in the samples from zero to 6 inches, 12 to 24 inches and above the silt. As discussed for the near-surface soil samples, methylene chloride and acetone are widespread contaminants in the site area and are not included as part of this discussion. At zero to 6 inches, three compounds were identified;

at 12 to 24 inches, eight compounds were identified. For samples from above silt (Elevation Code 109), seven compounds were identified. Figure 5.5.2.2-3 presents the results for key semi-volatiles for samples from immediately above the silt layer.

A summary of the detected herbicides, pesticides, and PCB's in the boring soil samples is given in Table 5.5.2.2-7. Of the 35 herbicides, pesticides, and PCB compounds, 10 (29 percent) were identified one or more times in the samples from zero to 6 inches, 12 to 24 inches and above the silt. At zero to 6 inches, nine compounds were identified; at 12 to 24 inches, nine compounds were identified; and in the samples from above the silt, eight compounds were identified. Figure 5.5.2.2-4 presents the results for key pesticides and herbicides for samples from above the silt layer.

The detected inorganic parameters as defined by the 13 metals, total cyanides and total phenols in the boring soil samples are summarized in Table 5.5.2.2-8. Of the 13 metals, 11 (85 percent) were identified one or more times. At zero to 6 inches, ten metals were identified; at 12 to 24 inches, 11 metals were identified; and in the samples from above the silt, 11 metals were identified. Selenium and thallium were not identified. All samples had positive cyanide results and 7 out of 8 phenol results were positive.

The concentrations of selected priority pollutants are presented in Figures 5.5.2.1-4 through 5.5.2.1-7. Figures 5.5.2.2-3 and 5.5.2.2-4 present similar results for the boring soil samples from above the silt.

5.5.2.3 Additional Dioxin Analyses

Because dioxin was identified in the silt layer on site, an evaluation was initiated to investigate potential cross contamination, and/or instrumental carry over from previous injections. As part of the evaluation, the laboratory blanks and the chronological analysis order were examined. In the laboratory blanks for the batch preparations of the affected samples, no dioxin was detected. Further review of the chronological order of analysis revealed that two samples were identified for reinjection of the original extract because samples of higher level concentrations had preceded their analysis. Both samples yielded acceptable results (±35 percent) for reinjection analysis when compared to the original analysis results.

To investigate potential cross contamination during boring and sample collection (composites of the top and bottom of a Shelby tube), selected geotechnical archive samples from the silt zone were retrieved for dioxin analysis. The original silt zone samples (201's) were not reused as part of this investigation except for F-5-E (Boring 11). Sample 201 from F-5-E was initially analyzed by the top and bottom compositing technique. As part of this investigation, the archived Shelby tube was retrieved for further analysis. F-5-E (Boring 11) and G-5-E (Boring 10) were part of a boring investigation program to establish the previously existing shoreline so as to define the extent of the organic silt zone. Two samples were selected from this boring program for dioxin analysis. Table 5.5.2.3-1 presents these results and the results from the additional silt zone archive samples for dioxin.

The additional samples from the silt zone archives were taken from the center of the archived Shelby tubes. The tube was clamped on the side adjacent to the location on the tube from which the sample was to be taken. The clamps were used to prevent distortion of the tube and any consequent kneading of the silt core during the process. After the clamps were secured, the steel tube was cut with a tool similar to a common tubing cutter. This cut only the tube, leaving the silt core intact. After cutting the tube, the core was broken and a sample was removed from each of the freshly exposed ends of the silt core with a clean stainless steel spoon. The two samples were composited for dioxin analysis.

As previously discussed the additional silt zone samples were not from the same depth as the initial samples. The evaluation of the data to define potential cross contamination during boring or sample collection was inconclusive.

5.6 GROUND WATER

The results of the ground water investigation at the site are presented in the following subsections. The results include monitoring well and piezometer levels, the determination of hydraulic conductivities from field slug test data, the calculation of ground water flow rates, and the chemical analysis data for the ground water samples.

5.6.1 Ground Water Levels

Ground water levels were observed on October 15, 1984 in the eight monitoring wells installed at the site (Figure 4.2.6-1). A summary of the observed levels is provided in Table 5.6.1-1. A comparison of monitoring well levels and Passaic River levels measured on this date is provided in Figures 5.6.1-1 through 5.6.1-8. As can be seen from the figures, the three monitoring wells nearest to the river (MW-1A, 2A, and 3A) fluctuate with the river. Ground water level contours based on these data are provided in Figure 5.6.1-9.

5.6.2 Hydraulic Conductivities

The slug test data were incrementally digitized from the continuous strip chart data taken in the field. This was done by selecting an arbitrary datum and scaling off values of time and pin deflection as a percent of full scale. Data reduction was accomplished using special forms to compute the value for head in feet for each selected time. The data were then input to the computer program SLUGT.

The program SLUGT computes aquifer transmissivity (T) and hydraulic conductivity (k) using two independent methods. The first method is the method of Cooper, Bredehoeft, and Papadapulos (1967) and applies to confined aquifer conditions for fully penetrating wells. The second method is the method of Bouwer and Rice (1976) and applies to unconfined aquifers for fully or partially penetrating wells.

SLUGT computes T and k values two ways under the second method. In the first case, the diameter of the drilled hole is taken as the diameter of the well, and whenever water level recovery occurs within the well screen, the cross-sectional area of the drilled hole corrected for the presence of the gravel pack is taken as the cross-sectional area of water level recovery. In the second case, the well casing or screen is used the in computation for both the well diameter and cross-sectional area of the water level recovery. A summary of the results indicating the computed hydraulic conductivities in each case is provided in Table 5.6.1-2.

Table 5.6.1-2 shows that the computed hydraulic conductivities range from 1.2 to 852 feet per day. With the exception of MW-4A and MW-8A, wide variations are also seen for each individual well. The Bouwer and Rice Method (where drilled-hole dimensions are used) yields the highest hydraulic conductivity values.

Representative mean values and a range of hydraulic conductivity were determined for each monitoring well location and are presented in Table 5.6.2-1. These values were selected from the results presented in Table 5.6.1-2 based on:

- The degree of confinement of the permeable zone at each well (to what extent it is confined or unconfined)
- Comparison of computed values to typical textbook values of hydraulic conductivity (Todd, 1960) for soils similar to the soil samples obtained at each well
- The apparent inappropriateness under existing site conditions of using the drilled-hole cross-sectional area in computing hydraulic conductivity under the Bouwer and Rice method.

As seen in Table 5.6.2-1, the representative mean hydraulic conductivity values for the most permeable zone range across the site from 3 to 200 feet per day. If the value of 200 feet per day at MW-2A is omitted, the range becomes 3 to 40 feet per day. Such ranges in mean permeability for the most permeable zone within a limited site area are to be expected when fill materials are involved. This is particularly true considering the nature of the fill--brick, building debris, wood, and other organic materials, in addition to the predominant sand, gravel, and varying amounts of silt.

5.6.3 Ground Water Flow Rates

Ground water flow rates were calculated based on the hydraulic conductivities presented in Table 5.6.2-1 and the gradients (change in head per unit distance) determined from Figure 5.6.1-9. An effective porosity of 0.30 was used for the fill. From the center of the site northward to the river, the computed ground water flow rate ranged from 0.6 to 4.0 feet per day. From the center of the site to the south, the range was 0.5 to 1.3 feet per day.

5.6.4 Analytical Laboratory Testing

Ground water samples were collected from each of the eight on-site monitoring wells as described in Subsection 4.2.6.3. Each sample was uniquely identified in accordance with the protocol described in Subsection 4.1.2 and presented in Appendix A. Sampling was conducted on October 9, 1984, and again on October 30, 1984, generating two sets of eight samples. Based on these preliminary dioxin results, the ground water from monitoring well MW-2A for a third time on December 14, 1984.

The first two rounds of ground water samples from all eight wells were analyzed for full priority pollutants plus 40 and dioxin. The third ground water sample from MW-2A was analyzed only for dioxin. Appendix F contains summaries of the quantitative analytical results (organic priority pollutant analyses and method detection levels) for each ground water sample, including summaries of the results of the 40 extraneous peak searches.

Of the 17 ground water samples analyzed for dioxin, 15 had identifiable dioxin concentrations. For the three ground water samples collected from MW-2A reanalysis of 5 to 1 dilutions was required to provide results in the instrument linear calibration range. Table 5.6.4-1 shows the samples that required reanalysis, the corrective action taken and the initial and final results. Table 5.6.4-2 is a summary of the ground water sample dioxin results by well number and grid location.

Priority pollutants were defined as the 157 compounds in the acid/base/neutral organics (semi-volatile), volatile organics, pesticides and PCB's, herbicides, metals, total cyanide, and total phenol analyses plus the 40 extraneous peak searches. Sixteen ground water samples were analyzed for full priority pollutants, as described in the following paragraphs.

A summary of all detected base/neutral and acid organic compounds identified in the ground water samples is presented in Table 5.6.4-3. Of the 69 semi-volatile compounds, 19 (28 percent) were identified in the initial round samples, 24 compounds (35 percent) were identified in the second round samples.

The detected volatile organic compounds in the ground water samples are summarized in Table 5.6.4-4. Of the 38 volatile organic compounds, 18 (47 percent) were identified one or more times in each of the two rounds of sampling.

A summary of the detected herbicides, pesticides, and PCB's in the ground water samples is given in Table 5.6.1-5. Of the 35 possible compounds, eight (23 percent) were identified one or more times in the first round samples and six compounds (17 percent) were identified in the second round samples.

The detected inorganic parameters as defined by the 13 metals, total cyanide, and total phenols in the ground water are summarized in Table 5.6.4-6. Of the 13 metals, 11 (85 percent) were identified one or more times in the first round samples and 12 metals (92 percent) were identified in the second round samples. Seven of the eight ground water samples had positive cyanide results in each round. Total phenols analysis showed positive results for all 16 samples analyzed.

5.7 PASSAIC RIVER WATER

5.7.1 Passaic River Levels

The mean tidal range (difference in height between mean high water and mean low water) is reported by the National Oceanic and Atmospheric Administration as 5.1 feet. The spring range (average semi-diurnal range occurring semi-monthly as a result of the full moon and new moon) is reported to be 6.1 feet. Tide levels in the Passaic River were measured over one complete tidal cycle on October 15, 1984, and were compared with ground water levels in the on-site monitoring wells. This information is presented in Figures 5.6.1-1 through 5.6.1-8.

5.7.2 Analytical Laboratory Testing

Two Passaic River water samples were collected (one on October 9, 1984 and one on October 30, 1984), concurrent with the ground water sampling for the eight on-site wells. These samples were collected by the procedures described in Subsection 4.2.7.2. Each sample was uniquely identified in accordance with the protocol described in Subsection 4.1.2 and presented in Appendix A.

Both samples were analyzed for dioxin and full priority pollutants. Priority pollutants were defined as the 157 compounds in the acid/base/

neutral (semivolatile) organics, volatile organics, pesticides and PCBs, herbicides, metals, total cyanide, and total phenol analyses plus the 40 extraneous peak searches. A complete list of the quantitative results for the priority pollutants and the 40 extraneous peaks is presented in Appendix F. Both samples had nondetectable (ND) results for dioxin. The October 9, 1984, sample was ND at a 0.004 part per billion detection limit and the October 30, 1984, sample was ND at a 0.007 part per billion detection limit.

A summary of all the detected compounds in the Passaic River water samples is given in Table 5.7.2-1. Of the 38 volatile organic compounds, six were detected in the first sample and five were detected in the second. Only two semivolatiles in the first sample and one semivolatile compound in the second out of 69 total were detected. Only two of the 35 total herbicide/pesticide/PCB's were detected in the first water sample, none was detected in the second. Of a possible 13 metals, four were detected in both Passaic River water samples. Both samples had positive results for total cyanides and total phenols.

5.8 PASSAIC RIVER SEDIMENTS

Passaic River sediment samples were taken as described in Subsection 4.2.8. Twenty-three locations were sampled in the Passaic River. In total, 36 samples were collected for dioxin--23 samples at depths of zero to 12 inches and 13 samples at depths of 12 to 24 inches. Fifteen priority pollutant samples were taken--10 samples at depths of zero to 12 inches and five samples at depths of 12 to 24 inches. Figure 5.8-1 shows the sample station locations in the Passaic River. Table 5.8-1 presents the designated analyses for each station. All samples collected were analyzed.

Of the 36 Passaic River sediment samples analyzed for dioxin, 26 samples had identifiable dioxin concentrations. Table 5.8-2 presents the Passaic River sediment dioxin analysis results. At zero to 12 inches, the dioxin concentrations ranged from 0.53 to 10.8 ppb with six samples having nondetectable dioxin concentrations at a detection limit of 0.78 ppb. At 12 to 24 inches, the dioxin concentrations ranged from 0.63 to 130 ppb with four samples having nondetectable dioxin concentrations at the 0.78 ppb detection limit.

Additional river sediment samples were obtained to a depth of six feet at Station 1-3-0. A geotechnical log is provided in Appendix B, and shows the sample locations. Table 5.8-3 presents the dioxin results of samples obtained at Station 1-3-0.

Priority pollutants were defined as 157 compounds in the acid/base/neutral (semi-volatile), volatile organic compounds (VOC), pesticides and PCB's, herbicides, metals, total cyanides, and phenols analyses plus 40 extraneous peak searches. The organic priority pollutant analysis levels and dilution factors that were utilized in the analyses of the sediment samples are presented in Table 5.8-4. Complete quantitative results for each sample are given in Appendix G.

A summary of all the detected base/neutral/acid organic compounds identified in the Passaic River sediments is given in Table 5.8-5. Of the 69 semi-volatile compounds, 17 (25 percent) were identified one or more times in the zero- to 12-inch or 12- to 24-inch samples. Fourteen compounds were identified in 28 percent of the samples at zero to 12 inches. Seventeen compounds were identified in 36 percent of the samples at 12 to 24 inches.

A summary of all the detected volatile organic compounds identified in the Passaic River sediments is presented in Table 5.8-6. Of the 38 volatile organic compounds, 10 were identified in one or more samples at the zero- to 12-inch or 12- to 24-inch depths. Eight compounds were identified in 53 percent of the samples at depths of zero to 6 inches. Ten compounds were identified in 46 percent of the samples at depths of 12 to 24 inches.

A summary of all the detected herbicide, pesticide, and PCB's in the Passaic River sediments is presented in Table 5.8-7. Of the 35 herbicide, pesticide, and PCB compounds, 11 were identified one or more times in the zero- to 12-inch or 12- to 24-inch samples. Ten compounds were identified in 42 percent of the samples at depths of zero to 12 inches. Eight compounds were identified in 35 percent of the samples at 12 to 24 inches.

Table 5.8-8 presents a summary of all the detected inorganic parameters as defined by the 13 metals, total cyanides, and total phenols in the Passaic River sediment samples. Of the 13 metals, 11 (85 percent) were identified one or more times in the zero- to 12-inch or 12- to 24-inch samples.

5.9 BACKGROUND SAMPLES

Samples were taken for priority pollutant and dioxin analysis at four locations off the site. Three samples were taken as described in Subsection 4.2.9.2 at Harrison Avenue, Raymond Boulevard, and Roanoke Avenue in Newark, New Jersey. Samples from Boring B-14 on the adjoining Sherwin-Williams property used for the installation of a monitoring well were also used to establish background levels of dioxin and priority pollutants.

5.9.1 Sherwin-Williams

Five samples were taken from the Sherwin-Williams property for analysis as described in Subsection 4.2.9.1 of this report. Samples collected at depths from zero to 6 inches, 6 to 12 inches, 12 to 24 inches, immediately above the silt zone, and in the silt zone were analyzed for dioxin. Samples from depths of zero to 6 inches, 12 to 24 inches, and immediately above the silt were analyzed for dioxin and priority pollutants. The dioxin results for the boring from the Sherwin-Williams property are presented in Table 5.9.1-1. Three of the five samples taken had detectable concentrations of dioxin.

Appendix H contains the quantitative results of the priority pollutant analysis. Of the 69 acid/base/neutral compounds, 20 (24 percent) were reported one or more times in the three samples analyzed. For the three samples analyzed, the results were as follows: of the 38 volatile organic compounds, three (8 percent) were reported one or more times; of the 35 herbicide, pesticide, and PCB compounds, two were reported one or more times; and of the 13 metals, 11 were reported all three times.

5.9.2 Newark

Samples collected at Harrison Avenue, Raymond Boulevard, and Roanoke Avenue were taken to establish a background for the area. Figure 4.2.9-1 indicates the sampling locations. Three samples were collected at depths of zero to 6 inches and analyzed for priority pollutants and dioxin. All quantitative results for each sample are given in Appendix H. The dioxin results of the three background samples from Newark are presented in Table 5.9.2-1.

A summary of the base/neutral/acid compounds detected in the near-surface soil samples from the site and the Newark background locations is presented in Table 5.9.2-2. Of the 69 semi-volatile compounds, 16 were identified in the Newark background samples one or more times. A summary of the volatile organic compounds detected in the near-surface soil samples from the site and Newark background samples is presented in Table 5.9.2-3. Methylene chloride was the only compound reported. A summary of the herbicides, pesticides, and PCB compounds detected in the near-surface soil samples from the site and the Newark background samples is provided in Table 5.9.2-4. Of the 35 herbicide, pesticide, and PCB compounds, three were detected one or more times. A summary of the inorganic parameters detected in the near-surface soils for the site and the Newark background samples is presented in Table 5.9.2-5. Of the 11 metals, 11 were identified one or more times. Positive total cyanide and phenol results were reported for four of the six samples analyzed.

5.10 DRUM WASTE CATEGORIZATION DATA AND DIOXIN ANALYSES

Waste Categorization

Subsequent to sampling and initial field testing of each drum, individual samples were composited for further waste categorization testing. Composites were limited to six drums per composite grouping and were based on such similarities as pH, drum content, and physical appearance. The major purpose of compositing drum samples was to survey the drums for dioxin contamination and to categorize their preliminary waste and hazard characteristics.

Composite drum samples and certain individual drums were tested for gross physical properties or waste categorization parameters. Appendix I contains both the inventory of drums sampled (Subsection 4.2.10) along with a summary of results. Group numbers and composite numbers refer to drum labels and locations shown in Figures 4.2.10-1 through 4.2.10-4, and the drum inventory provided in Appendix I.

Ten parameters were examined in the drum sampling program. They were:

- Water reactivity - solubility
- Water reactivity - temperature change
- Percent lower explosive limit (LEL)
- pH
- Presence of oxidizable materials (OX)
- Presence of peroxides (peroxide)
- Sample type
- Open cup ignitability
- Open cup flashpoint
- Presence of halogens (halogens).

Throughout the summary tables, the following designations are used and retain the same meaning regardless of their location:

- ND = not detected
- P = present
- A = absent.

Other designations are used for specific parameters. These are:

- Solubility - The ability of the material to combine with water, and reported on a visually determined scale of none, slight, moderate, and complete. The designation is subjective.

- Temperature Change - As the sample material was mixed with water, the relative temperature of the reaction vessel was assessed by touch and reported as increasing, decreasing, or no change (none detected).

- Percent Lower Explosive Limit (LEL) - With the detection meter calibrated to 10 percent, vapor from the sample was tested for percent of combustible organic vapors present. Only four composite samples (Pit-2, PP-2, PP-3, PP-6) and one individual drum (No. 120) registered on the LEL meter. Sample PP-3 registered 6 percent, PP2 and PP-6 registered 3 percent, the two Pit-2 drums showed 2 percent, and Drum 120 registered 2 percent.

- Oxidizable Material (OX) - This test was performed to determine the presence of any material that readily initiates the combustion of organic matter. All of the individual drums or composite samples showed negative tests for the presence of oxidizable materials.

- Peroxides - All tests for the presence of peroxides produced negative results.

- Sample Type - This visual classification of the physical state of the sample was presented simply as solid, liquid, sludge, or multilayered.

- Open-Cup Ignitability - This test identifies wastes which present fire hazards from ignitability under conditions existing during routine storage, disposal, and transportation. Results were shown as: does not ignite when heated (DNI) or ignites when heated (IWH). Other assessments were also made as to the ability to sustain combustion and the type of flame generated.

- Open Cup Flashpoint - The material was heated in an open cup to 140 degrees Fahrenheit. If it ignited the temperature was recorded in degrees

Fahrenheit. If it did not ignite upon reaching 140 degrees Fahrenheit, the result was recorded as having a flashpoint greater than 140 degrees Fahrenheit.

- Halogens - Bielstein's copper wire test was performed on each sample. If the flame was green colored, the test was recorded as halogens present (P). If not, it was recorded as halogens absent (A).

Dioxin Analysis

Dioxin analysis was performed on 22 selected drum samples. Drums to be tested were selected by one of two criteria--either the drum was representative of a major group of drums or it had some particular association with the manufacturing process. Appendix I contains two drum sampling inventories--one organized sequentially by sample ID number and one sorted by group code. This provides easy cross reference between individual samples and drum ID numbers and the group of composites it represents.

Table 5.10-1 presents the results of the representative dioxin analyses from the drum sampling program. Of the 22 drums analyzed, 15 showed positive results, ranging from a low of 1.5 ppb to a high of 12,200 ppb. The median value was 13.9 ppb. Seven of the 22 samples had no detectable quantity of dioxin present. The detection limit of each negative result is shown in Table 5.10-1 in parentheses after the concentration value.

If the result for a particular drum was positive for dioxin, all the drums in its associated composite were also considered contaminated.

5.11 2,3,7,8-TETRACHLORODIBENZOFURANS AND OCTACHLORODIBENZO-P-DIOXIN ANALYSES

As specified in the Work Plan, 10 percent of the near-surface soil samples, boring soil samples, and Passaic River sediment samples were analyzed for 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) and octachlorodibenzo-p-dioxin (OCDD). The 2,3,7,8-TCDF analyses were run under the same conditions as the dioxin (2,3,7,8-TCDD) analyses. This includes the seven isomer dioxin performance mixture for demonstrating separation of the dioxin isomers. An analogous mixture for all of the furan isomers is not available, because TCDF reference standards are not available. It has been reported in the scientific literature that the TCDF isomers will be separated under the same conditions that separate the TCDD isomers; therefore, the 7 isomer TCDD mix was used to demonstrate this capability. However, since the full separation of the TCDF isomers cannot actually be demonstrated, the result reported for 2,3,7,8-TCDF should be considered the maximum concentration for this compound in the sample. Procedures for analysis of 2,3,7,8-TCDF and OCDD were presented in the Work Plan.

A total of 156 soil samples were analyzed for dioxin, including additional analyses and background samples. Twenty-four samples were analyzed for 2,3,7,8-TCDF and OCDD. Table 5.11-1 presents the results of these analyses.

5.12 ANALYTICAL RESULTS FOR QUALITY ASSURANCE/QUALITY CONTROL CHECKS

Quality assurance/quality control checks were performed routinely throughout the course of the sampling and analysis activities. Several levels of QC checks were implemented, as described in the QA Plan contained in the Work Plan, including field/trip blanks, individual laboratory analysis-specific QC measures, an additional set of "Program QC" samples initiated by the QA Program Director, and specific QC samples initiated by the NJDEP.

Precision, accuracy, and completeness objectives for the analytical program were established in the Work Plan, and are presented in Table 5.12-1. Similar QC acceptance criteria were available for those analyses performed under EPA's CLP protocol. Where available, these analyte specific acceptance limits were used.

Presented in the following discussion is a detailed description of the QA/QC procedures performed and the results obtained to verify compliance with the stated QA objectives.

5.12.1 Sampling Quality Control Checks: Field and Trip Blanks

Table 5.12.1-1 summarizes the field blanks associated with each sample matrix, the analyses performed on the blanks, and the percent of blanks to total samples collected for each case. The overall goal (number of blanks equal to 5 percent of the total number of samples collected) was realized; the goal of 1 percent blanks for each non-VOA parameter in solid matrix samples was also met. Trip blanks were collected with each field blank (i.e., a field and trip blank pair) for solid and water samples.

Analytical results for all field and trip blanks associated with solid and water samples are presented in Tables 5.12.1-2 through 5.12.1-4 and Appendix J. Significant contamination was not detected in any of the blanks analyzed for dioxin, extractable priority pollutants, metals, cyanide, or phenols. Volatile analysis did indicate low levels of several compounds in many of the blanks. Table 5.12.1-5 summarizes the contaminants and concentration ranges observed. The trip blanks are generally less contaminated than the field blanks, both in number of positive results and concentration, indicating some contamination may have occurred during sampling due to unclean equipment. However, for both types of blanks, contamination with methylene chloride and acetone may have occurred as part of the sample handling process discussed in Subsection 5.2.2.1. None of the results were high enough, however, to significantly affect the quality of the sample results. In most cases, e.g., methylene chloride, the samples showed much higher concentrations of the compound than the blanks.

Two wipe field blanks showed positive dioxin results: F014-0100-W-L (September 7, 1984) at 25 ng and F048-0659-W-L (September 20, 1984) at

2.7 ng. All samples collected on September 7, 1984 prior to preparation of the wipe blank showed no detectable dioxin; therefore, the one wipe sample associated with it was scheduled for recollection (at an adjacent location), with a new field blank. The new field blank showed no detectable dioxin. On September 20, all four collected wipe samples indicated extremely high levels of dioxin; therefore the blank result was negligible.

The two chip field blanks and the paired trip blanks showed no detectable levels of dioxin.

5.12.2 Individual Laboratory Quality Control Checks

Following are discussions of the QC checks performed by the three ITC laboratories which provided analyses.

5.12.2.1 Organic Priority Pollutant Analyses - ITC Cerritos Laboratory

For all parameters (except herbicides) EPA-Contract Laboratory Program (CLP) procedures were followed, as described in the Work Plan. EPA Method SWA 8150 was used for the chlorinated herbicide analyses; these compounds are not included in the CLP protocols, and are, therefore, not subject to the same QC criteria.

Instrument calibrations were performed and documented every eight hours. Support data for these QC checks are contained in the complete laboratory batch reports provided with each set of sample results. Laboratory blanks were also analyzed at least once every eight hours for each type of analysis performed. No significant contamination was observed in the laboratory blanks for extractable parameters (BNA, pesticide, herbicide). Volatile blanks did consistently show low levels of methylene chloride--generally below the quantitation limit. Complete data for all laboratory blanks are also contained in the batch reports.

Surrogate standards were added to every sample analyzed to monitor percent recovery. Representative compounds not on the priority pollutant parameter list are used for each analysis fraction (VOA, BNA, pesticide). The QC acceptance limits for surrogate recoveries are listed in Table 5.12.2.1-1.

A matrix spike (MS) and matrix spike duplicate (MSD) pair was analyzed at least once for each set of 20 samples of a given matrix; the sample for MS/MSD analysis was selected randomly. Spike compounds were selected from the priority pollutant lists for each analysis fraction. Recovery data were used to evaluate method accuracy. Comparison of the results for each spike compound in the MS to the analagous results in the MSD allows calculation of Relative Percent Difference (RPD), a measure of method precision. The QC acceptance limits for spike recoveries and RPD's are listed in Table 5.12.2.1-2.

The discussion below summarizes the QC check sample results for the samples analyzed at the Cerritos laboratory for organic priority pollutants. The results are matrix-specific for the three major sample types analyzed: soil, sediment, and water.

5.12.2.1.1 Soil QC Summary

Surrogate Recoveries

Table 5.12.2.1.1-1 summarizes the surrogate recovery results for all soil samples. Recoveries outside the stated QC limits, as per Table 5.12.2.1-1, have not been included in the calculation of average percent recovery for each surrogate compound. Excluding the pesticide surrogate, outside recoveries represent only 4.2 percent of the total analyses performed on these samples. This is well within the completeness objective of 90 percent, and, therefore, does not adversely affect overall data quality. The number of recoveries outside of the QC limits for each surrogate is summarized in Table 5.12.2.1.1-2. All of the pesticide surrogate outside recoveries, in low and medium level analyses, are due to dilution of the extracts prior to analysis. Recoveries were not obtained for these samples.

One soil sample showed very low recoveries for all six BNA surrogates; three of these were outside the QC limits. In accordance with CLP protocol, the sample was reextracted; reanalysis showed identical surrogate recovery results, indicating a significant matrix effect for this sample.

As presented in Table 5.12.2.1.1-1, all average percent recoveries for surrogate compounds are well within the stated QC acceptance criteria (as defined in Table 5.12.2.1-1) for soil samples. The consistency of the recovery results, as measured by the standard deviation, is also acceptable for each compound.

Matrix Spike/Matrix Spike Duplicates

A total of 75 soil matrix samples were analyzed for all organic priority pollutants. Table 5.12.2.1.1-3 summarizes the number of MS/MSD pairs analyzed by analysis fraction and level. All QC check frequencies for soils are greater than the minimum 5 percent objective.

Tables 5.12.2.1.1-4 through 5.12.2.1.1-6 summarize the average percent recoveries and RPD's for all spike compounds. Recoveries outside QC acceptance limits are not included in these calculations. Excluding pesticide spikes, only 4 percent of the results were outside of recovery limits. These all occurred in the medium BNA analysis of a single MS/MSD pair. The compounds were pyrene and phenol. Because the recoveries properly duplicated for both compounds in the MS and MSD, the RPD fell in the acceptable range.

A total of 15 results were outside recovery acceptance limits in the low and medium pesticide QC samples; eight of these were due to dilution. Six of the remaining outside recoveries are specific to 4,4'-DDT. In all cases, the MS and MSD recoveries for DDT were consistent for the QC sample pair. The RPD, therefore, is acceptable, and an apparent sample matrix effect for this compound is noted.

The total number of outside recovery results, representing 7.4 percent of the total soil analyses performed, does not affect overall data quality. The average percent recoveries and average RPD values for volatile, BNA, and pesticide spike compounds are all well within the acceptable QC limits, with the exception of DDT in the medium pesticide fraction for which all four recoveries (two MS/MSD pairs) were outside the QC limits due to a matrix effect in one case and dilution in the other.

Specific recovery and precision criteria have been established for the herbicide fraction compounds. The average recoveries for all compounds except Dinoseb range from 45 to 74 percent. Recovery was not obtained for Dinoseb. The recoveries were reasonably consistent within each MS/MSD pair (all RPD's <50), but were widely scattered between samples (high standard deviations).

5.12.2.1.2 Sediment QC Summary

Surrogate Recoveries

Table 5.12.2.1.2-1 summarizes the surrogate recovery results for all sediment samples. All recoveries were within QC acceptance limits. Also, all average percent recoveries for surrogates in the sediment samples are well within the stated QC acceptance limits for soil matrix samples with no exceptions.

Matrix Spike/Matrix Spike Duplicates

A total of 15 sediment samples were analyzed for full organic priority pollutants; one MS/MSD pair was analyzed for each analysis fraction and level, as outlined below:

Low VOA - 1 of 15 samples 6.7% frequency
Low BNA - 1 of 10 samples 10% frequency
Med BNA - 1 of 5 samples 20% frequency
Low Pesticide - 1 of 13 samples 7.7% frequency
Med Pesticide - 1 of 2 samples 50% frequency
Herbicide - 1 of 15 samples 6.7% frequency

The 5 percent minimum QC check frequency was achieved.

Tables 5.12.2.1.2-2 through 5.12.2.1.2-4 summarize the average percent recoveries and RPD's for all spike compounds. Recoveries outside QC acceptance limits are not included in these calculations; however, only two were noted, and these were for pyrene in the MS and MSD pair analyzed. The observed recoveries for pyrene were 20 percent in each QC sample, only slightly below the lower QC acceptance limit of 26 percent.

The accuracy (average percent recovery) and precision (RPD) measures for all priority pollutant spike compounds are well within the stated QC acceptance limits. Herbicide spike recoveries range from 47 to 95 percent recovery except for Dinoseb, which shows an average recovery of 2.1 percent.

Sediment priority pollutant data quality has not been affected by the small number of results outside of QC objectives.

5.12.2.1.3 Water QC Summary

Surrogate Recoveries

Table 5.12.2.1.3-1 summarizes the average surrogate recovery results for all water samples (all were performed as low-level analyses). Recoveries outside of QC limits are not included. The number of results outside recovery limits for each surrogate are listed in Table 5.12.2.1.3-2. Most of these are due to dilution. Seven of the BNA sample analyses indicated no recovery for all six surrogates for this reason. All 18 of the pesticide outside recoveries are due to dilution. The results outside of QC acceptance limits do not affect overall water data quality.

All average percent recoveries are within stated QC acceptance limits.

Matrix Spike/Matrix Spike Duplicates

A total of 24 water samples were analyzed for all organic priority pollutants. Listed below is the number and frequency of QC check sample pairs analyzed:

Low VOA	- 2 of 24 samples	8.3% frequency
Low BNA	- 2 of 24 samples	8.3% frequency
Low Pesticide	- 2 of 24 samples	8.3% frequency
Herbicide	- 1 of 24 samples	4.2% frequency

Table 5.12.2.1.3-3 summarizes the average percent recoveries and RPD's for low volatile, BNA, and pesticide spike compounds. The herbicide MS/MSD pair required dilution; therefore no recoveries were obtained. One of the two pesticide MS/MSD pairs also required dilution due to extremely high levels of DDT in the sample. Recovery is not reportable for this QC sample. No other recovery or RPD values outside the QC limits occurred.

All average percent recovery and average RPD values presented in Table 5.12.2.1.3-3 are well within the stated QC acceptance limits for water samples.

5.12.2.2 Inorganic Priority Pollutant and Classical Analyses - ITC Middlebrook Pike Laboratory

A total of 75 soils, 15 sediments, and 24 waters were analyzed for priority pollutant metals, total cyanide, and total phenols at the

Middlebrook Pike laboratory. EPA methods, as specified in the Work Plan, were used for analysis.

Calibration standards and laboratory blanks were analyzed and documented a minimum of once per eight-hour shift. Contamination of sufficient concentration to affect results was not observed in any of the laboratory-prepared blanks. Full documentation of all standards, blanks, and daily control charts is contained in the laboratory files.

Table 5.12.2.2-1 summarizes the spike and duplicate analyses performed for each sample matrix. In all cases, QC checks were greater than 5 percent of the total samples analyzed for each matrix.

The results of spike recovery, laboratory blanks, and duplicate (blind split) analyses are contained in Appendix J. Table 5.12.2.2-2 summarizes the RPD values for inorganic duplicates on water and soil/sediment matrices. Nine of the RPD values are greater than 20 percent, indicating relatively low reproducibility between original and duplicate sample results. However, as Figure 5.12.2.2-1 shows, the method itself is precise to within 10 percent for standard response factors over a month-long period. Two explanations could account for the observed RPDs: (1) many of the measurements are at or near the detection limit, where the method is, by definition, at the limit of its precision and accuracy; and (2) sample nonhomogeneity and/or matrix effects make it difficult to reproduce results precisely, regardless of the degree of homogenization.

The average percent recovery for each spike compound, including all matrices, is shown in Table 5.12.2.2-2.

All of these average recoveries are within the QA objective limits as stated in the Work Plan.

5.12.2.3 Dioxin Analysis - ITC Directors Drive Laboratory

EPA Procedures, as detailed and modified in the Work Plan, were applied for the analysis of dioxin (2,3,7,8-TCDD) samples.

Instrument calibrations were performed and documented every eight hours; method blanks were also run every eight hours, or at least once for each batch of up to 20 samples; support data for these routine checks are contained in the complete laboratory batch reports. Contamination was not detected in any method blanks.

Surrogate standards were added to every sample prior to extraction; comparison of the ^{37}Cl-TCDD recovery to the ^{13}C-TCDD recovery yields a value of "Percent Accuracy," as described by the EPA method. Excluding samples where saturated dioxin results were obtained, the percent accuracy result was within the QC acceptable limits of 60 to 140 percent for all samples reported. The only results for which the accuracy did not meet this criteria were those which were initially saturated and reanalyzed as extract dilutions, so that the surrogates were too dilute to measure. This category accounts for less than 2 percent of all reported dioxin results.

A sample spike and duplicate pair were analyzed with each batch of up to 20 samples. A total of 27 QC sample pairs were analyzed, representing 6.1 percent of the total samples analyzed for dioxin (wipe and air samples are excluded from this calculation).

Table 5.12.2.3-1 presents a summary of the duplicate results. Relative percent deviations (RPD's) have been calculated; only three are above 40 percent. This was determined to be an acceptable level for this analysis based on the percent recovery requirements. Of the three results above 40 percent, two are at or near the method detection limits. Excluding these three results, the average RPD is 15 (±13), which is well within QC acceptable limits.

Table 5.12.2.3-2 presents the spike recovery data for the QC samples. Thirteen of the 27 samples selected for QC analysis showed dioxin at concentrations greater than or equal to 10 ppb; the spike level of 1.0 ppb becomes negligible for these samples, negating meaningful recovery calculations. These values have, therefore, been excluded from this table. The average percent recovery is calculated to be 93 (±17) percent.

Partial scan GC/MS confirmations were performed on 35 samples with positive dioxin results. Of these, 29 (83 percent) passed all criteria required for a final confirmation of the presence of 2,3,7,8-TCDD. Two of the four failures were due to dioxin levels too low to be detected by the partial scan method. Back-up documentation of these analyses is contained in the dioxin laboratory batch reports.

Two special QC samples were analyzed in an effort to determine the efficiency of the wipe sampling technique used. A piece of aluminum foil, measuring 46 x 54 cm (2,480 cm^2), was spiked with 250 µl of a 0.2 ppm 2,3,7,8-TCDD standard solution (equivalent to 50 ng dioxin) by applying the solution in an "S" pattern across the foil surface. The spiked foil was allowed to air dry for 30 minutes, until no solvent was observed. A 3-by-3-inch gauze wipe was wetted with 10 ml of hexane, and then used to "sample" the foil surface in accordance with the wipe sampling procedure used on site. This spiked foil sample was prepared, sampled, and extracted in duplicate at the Directors Drive laboratory.

Results for the duplicate samples were as follows:

SAMPLE NO.	AMOUNT OF DIOXIN RECOVERED	% RECOVERY
J2196	39.8 ng	80
J2197	35.4 ng	71

The average recovery is 76 (±4.5), which is within the acceptable range of precision for the dioxin analysis method.

5.12.3 Program Quality Control Checks

A total of 29 additional QC samples were initiated at the Middlebrook Pike laboratory by the QA Program Manager as Program Level Quality Control analyses. The additional samples consisted of splits prepared at the site at the direction of the QA Program Manager and QC blank and spike samples prepared in the Middlebrook Pike laboratory, transported to the site, and included with the routine shipments to the laboratories. The directed splits and interlaboratory splits were assigned to a specific laboratory for analysis by the on-site Sampling Coordinator, at the time of sample collection. Following is a breakdown of the types of Program QC samples and analyses assigned:

TYPE QC	MATRIX	# SAMPLES	ANALYSES REQUIRED
Directed Splits	Soil	3	All Parameters
	Soil	3	Dioxin
	Water	1	All Parameters
	Chips	3	Dioxin
Blank	Wipe	3	Dioxin
	Water	1	All Parameters
	Soil	3	Dioxin
Spike	Wipe	3	Dioxin
	Soil	3	Dioxin
Interlaboratory Splits	Water	1	Inorganics (at Cerritos)
	Water	1	Organics (at Middlebrook Pike)
	Soil	2	Inorganics (at Cerritos)
	Soil	2	Organics (at Middlebrook Pike)

5.12.3.1 QC Blanks

Dioxin results for the blank Program QC check samples assigned are presented in Table 5.12.3.1-1; one wipe blank was lost during extraction, so a result for this blank is not available. Additional organic and inorganic/classical parameter results for the water blank are contained in Appendix J.

No significant contamination was detected in the wipe blanks or the water blank as shown in Table 5.12.3.1.-1 and Appendix J. The soil blanks were aliquots of a supply of Clarksburg soil, originally obtained from the EPA-OHMSETT facility in Leonardo, New Jersey and described as "virgin with respect to 2,3,7,8-TCDD." The soil had been stored, however, in the dioxin preparatory laboratory since its arrival in 1983; thus, contamination from its storage location most likely explains the low levels of dioxin detected. The average of 1.1 (±0.4) ppb is just above the detection limit for the analysis. The water blank result was below the instrumental detection limit.

5.12.3.2 QC Blank Spikes

Table 5.12.3.2-1 provides the recovery results for the QC Program spiked wipes and soils. The average percent recovery for the wipe samples is 90 (±4.2). For the soils, the average recovery is 118 (±9.5). Both of these averages are within acceptable limits, as prescribed in Table 5.12-1.

5.12.3.3 Directed Sample Splits

Table 5.12.3.3-1 contains the duplicate results summary for dioxin in the 10 sample splits which were initiated at the QA Program Manager's direction. Complete parameter results for the three soil and one water split designated for full analysis are presented in Appendix J.

For the dioxin results in soil samples, a major difference is noted in the RPD values for comparison of 10-gram aliquot samples versus one-gram aliquot samples. In all four cases, the RPD is vastly improved for the 10-gram results. This is most probably due to the difficulty encountered in obtaining a one-gram aliquot that is truly representative of the entire sample, regardless of the degree of homogenization. The one-gram RPD values have, therefore, been excluded from calculation of the average, which is 33 (±34). This is within acceptable QC limits for overall precision.

In general, no significant differences are noted in the original and duplicate results for the remaining organic and inorganic/classical parameters.

5.12.3.4 ITC Interlaboratory Splits

Two soil samples and one water sample were split at the time of collection for duplicate analysis of organics at the Middlebrook Pike laboratory and inorganics at the Cerritos laboratory. Analyses of organics for the project were performed at Cerritos, and analyses for inorganics were performed at Middlebrook Pike.

The results for these samples are presented in Appendix J. The duplicate water results agree well for all parameters, with the exception of a relatively high result for total cyanide from Cerritos as compared to Middlebrook Pike. Three very low herbicide values reported by Middlebrook Pike are below the detection limit reported by Cerritos.

Significant variation was observed in the BNA results for both soil samples. This can be traced to the fact that both were screened as low level analyses for this fraction at Cerritos, but screening results indicated medium level analysis at Middlebrook Pike. The positive BNA results from Cerritos are below the detection limits of the medium analysis performed at Middlebrook Pike.

EPA criteria do not require reanalysis of medium level samples as low level samples if compounds are not detected in the medium, as the GC screen indicates the dilution is appropriate. The same explanation is true for the volatile parameters in the second split pair (Y1764-original); the volatile analysis performed at Middlebrook Pike was done as a medium level, and at Cerritos as a low level.

All other parameters were in good agreement for the split soil samples.

5.12.4 NJDEP-Designated Quality Control Checks

The NJDEP On-Scene Coordinator(s) (OSC) initiated two types of quality control samples: (1) collection of sample splits in the field, for analysis at an independent laboratory in addition to the ITC laboratories, and (2) assignment of soil proficiency samples for dioxin analysis.

Table 5.12.4-1 lists the samples split at the time of collection at the direction of the OSC. ITC results for these samples, for the analyses indicated, are reported herein with all other analytical results. Results for samples analyzed at NJDEP's chosen independent laboratory have not been received by ITC, and are, therefore, not included in this report.

Table 5.12-4-2 contains the dioxin results for the NJDEP soil proficiency samples. One sample (not listed in the table), ITC No. 9400-1763-T-L (NJDEP A037), was received broken at the laboratory on October 23, 1984; the sample was voided as instructed by L. Geiger (NJDEP-OSC); therefore, analysis was not required. All samples labeled "blank spike" were described as "blank-to be spiked with 2,3,7,8-TCDD at 1 ppb" on the Chain-of-Custody record. The confirmed concentration of the spiking solution used was 160 pg/µl; 100 µl is spiked onto 10 grams of soil prior to extraction. Thus, the actual spike level used for these samples was 1.6 ng/g, or 1.6 ppb.

5.0 REFERENCES

Bouwer, H. and R. C. Rice, 1976, A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells, Water Resources Research, Vol. 12, No. 3, pp. 423-428.

Cooper, H. H., J. D. Bredehoeft, and I. S. Papadopulos, 1967, Response of a Finite-Diameter Well to an Instantaneous Charge of Water, Water Resources Research, Vol. 3, No. 1, pp. 263-269.

Todd, D. K., 1960, Ground Water Hydrology, John Wiley & Sons, Inc., 53 p.

TABLES

TABLE 5.1-1

AMBIENT AIR SAMPLES
RESULTS: IRON AND MANGANESE
(10-31-84)

COLLECTION DATE		RESULTS (μg/filter) Fe	Mn	Fe+Mn	NJDEP SAMPLE DATES	SAMPLES TO BE ANALYZED FOR FULL AMBIENT AIR PARAMETERS
09-08-84	A002-0142-A-K	252	7.1	259		
09-09-84	A002-0143-A-K	704	21	725	X	
09-10-84	A002-0144-A-K	1,280	34	1,314*		0
09-11-84	A002-0181-A-K	1,550	41	1,591*		0
09-12-84	A002-0182-A-K	1,740	91	1,831*		0
09-13-84	A002-0183-A-K	917	31	918		
09-14-84	A002-0410-A-K	823	22	845		
09-15-84	A002-0412-A-K	259	7.1	266	X	
09-16-84	A002-0413-A-K	702	17	719		
09-17-84	A002-0414-A-K	1,230	34	1,264*		0
09-18-84	A002-0415-A-K	1,090	31	1,121		
09-19-84	A002-0597-A-K	1,770	57	1,827*		0
09-20-84	A002-0598-A-K	992	34	1,026		
09-21-84	A002-0711-A-K	1,080	38	1,118	X	0
09-22-84	A002-0712-A-K	676	21	697		
09-23-84	A002-0713-A-K	702	22	724		
09-24-84	A002-0714-A-K	1,520	37	1,557*		0
09-25-84	A002-0843-A-K	2,030	63	2,093*		0
09-26-84	A002-0844-A-K	745	19	764		
09-27-84	A002-0845-A-K	810	19	829	X	
09-28-84	A002-1072-A-K	566	15	581		
09-29-84	A002-1073-A-K	448	11	459		
09-30-84	A002-1074-A-K	597	25	622		
10-01-84	A002-1082-A-K	312	8.5	320		
10-02-84	A002-1083-A-K	590	26	616		
10-03-84	A002-1084-A-K	1,200	34	1,234*	X	0
10-04-84	A002-1241-A-K	1,460	52	1,512*		0
10-05-84	A002-1242-A-K	1,030	21	1,051		
10-06-84	A002-1243-A-K	1,040	27	1,067		
10-07-84	A002-1329-A-K	610	19	629		
10-08-84	A002-1330-A-K	1,160	37	1,197*		

*Denotes 10 highest total (Fe + Mn) results.

TABLE 5.1-2

SITE INVESTIGATION
AMBIENT AIR RESULTS FOR
TOTAL SUSPENDED PARTICULATES (TSP)
INHALABLE PARTICULATE MATTER (IPM) AND METALS

DATE AND SAMPLE ID PARAMETERS	9-10-84 -0144-A-K	9-11-84 -0181-	9-12-84 -0182-	9-17-84 -0414-	9-19-84 -0597-	9-21-84 -0711-	9-24-84 -0714-	9-25-84 -0843-	10-3-84 -1084-	10-4-84 -1241-
Particulates: ($\mu g/m^3$)										
TSP	188	151	117	102	165	85	153	254	114	87
IPM	118	79	74	75	100	54	123	196	56	75
Metals: ($\mu g/m^3$)										
Iron	0.732	0.908	0.997	0.944	1.004	0.682	1,078	1,259	0.764	0.908
Manganese	0.019	0.024	0.052	0.026	0.032	0.024	0.026	0.039	0.020	0.032
Cadmium	0.003	0.004	0.003	0.003	0.003	0.001	0.003	0.009	0.003	0.004
Copper	0.031	0.033	0.033	0.046	0.037	0.030	0.060	0.054	0.018	0.081
Nickel	0.019	0.026	0.025	0.025	0.026	0.014	0.016	0.014	0.013	0.027
Lead	0.364	0.246	0.399	0.425	0.298	0.353	0.575	0.403	0.181	0.684
Vanadium	0.025	0.018	0.017	0.041	<0.014	<0.016	0.020	0.019	<0.015	<0.016
Zinc	0.240	0.170	0.321	0.368	0.227	0.373	0.348	0.273	0.100	0.871

TABLE 5.1-3

SITE INVESTIGATION
AMBIENT AIR RESULTS FOR DIOXIN

DATE AND SAMPLE ID PARAMETERS	9-10-84 -0144-A-K	9-11-84 -0181-	9-12-84 -0182-	9-17-84 -0414-	9-19-84 -0597-	9-21-84 -0711-	9-24-84 -0714-	9-25-84 -0843-	10-3-84 -1084-	10-4-84 -1241-
Dioxin ($\rho g/m^3$)	86	ND(<8)	ND(<6)	ND(<31)	ND(<8)	ND(<4)	286	ND(<10)	ND(<6)	ND(<15)

TABLE 5.1-4

SITE INVESTIGATION
AMBIENT AIR RESULTS FOR
VJNYL CHLORIDE AND VOC's

DATE AND SAMPLE ID PARAMETERS	9-10-84 -0144-A-K	9-11-84 -0181-	9-12-84 -0182-	9-17-84 -0414-	9-19-84 -0597-	9-21-84 -0711-	9-24-84 -0714-	9-25-84 -0843-	10-3-84 -1084-	10-4-84 -1241-
Vinyl Chloride	ND	0.15	0.26	0.33	<0.12	ND	0.17	0.24	ND	ND
VOC's: ($\mu g/m^3$)										
Methylene chloride	2.86	*	0.81	-	4.27	2.93	ND	2.74	0.94	2.27
1,1-dichloroethene	ND	*	ND	-	ND	ND	ND	ND	ND	ND
Chloroform	0.28	*	0.56	-	0.44	0.66	ND	0.30	0.28	0.53
1,2-dichloroethane	2.5	*	0.58	-	6.29	0.15	ND	3.10	ND	0.55
1,4-dioxane	ND	*	ND	-	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.76	*	0.69	-	0.47	0.47	1.03	1.08	0.56	0.60
Trichloroethene	5.60	7.07	12.58	-	13.48	9.18	25.10	11.92	8.14	26.67
Benzene	1.43	1.61	3.55	-	2.36	2.67	5.02	7.39	1.50	6.8
1,1,2-trichloroethane	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
1,2-dibromethane	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
Tetrachloroethene	2.14	1.36	5.95	-	2.36	3.19	10.44	5.48	1.63	6.4
1,1,2,2-tetrachloroethane	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
Toluene	30.95	22.33	32.04	-	25.84	21.68	36.99	33.37	15.04	29.33
Chlorobenzene	ND	ND	1.04	-	ND	0.52	1.58	ND	ND	ND
Ethylbenzene	8.21	5.46	8.12	-	7.75	4.59	38.31	17.88	5.14	6.67
Styrene	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
M-xylene	25.00	17.37	21.74	-	28.09	11.73	22.46	51.25	20.05	20.00
O-xylene	11.43	8.19	9.50	-	12.36	4.59	10.57	23.84	9.40	8.80
P-xylene	11.43	8.19	9.50	-	12.36	4.59	10.57	23.84	9.40	8.80
O-chlorotoluene	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
P-chlorotoluene	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
O-dichlorobenzene	0.38	0.33	0.73	-	0.16	<0.06	1.85	ND	0.20	0.43
P-dichlorobenzene	0.38	0.33	0.73	-	0.65	3.83	1.98	ND	0.20	0.43

*Run partially lost, compounds may be present.

- = Sample broken in shipment.

TABLE 5.1-5

SITE INVESTIGATION
AMBIENT AIR RESULTS FOR ASBESTOS

DATE AND SAMPLE ID PARAMETERS	9-10-84 -0144-A-K	9-11-84 -0181-	9-12-84 -0182-	9-17-84 -0414-	9-19-84 -0597-	9-21-84 -0711-	9-24-84 -0714-	9-25-84 -0843-	10-3-84 -1084-	10-4-84 -1241-
Asbestos: $\left(\frac{\text{fibers}}{\text{cm}^3}\right)$	0.009	0.002	0.001	0.004	0.003	0.002	0.003	0.005	0.001	0.003

TABLE 5.1-6

SITE INVESTIGATION
AMBIENT AIR RESULTS FOR PESTICIDES

DATE AND SAMPLE ID PARAMETERS	9-10-84 -0144-A-K	9-11-84 -0181-	9-12-84 -0182-	9-17-84 -0414-	9-19-84 -0597-	9-21-84 -0711-	9-24-84 -0714-	9-25-84 -0843-	10-3-84 -1084-	10-4-84 -1241-
Pesticides: (ng/m^3)										
Benzene sulfonyl chloride	2.97	<2.38	<2.22	<14.39*	<2.55	<14.39*	<7.55*	<2.36	<2.36	<2.44
Tetrachlorobenzene	<0.1	<0.10	<0.10	<35.97*	<0.06	<0.75*	1.74*	<0.10	<0.10	<1.04*
4-chlorobenzene sulfonyl chloride	<13.5	<13.6	<12.7	<14.39	24.20	<14.39	<15.09	18.92	<13.47	<139.3*
4-methanybenzene sulfonyl chloride	43.92	29.93	50.79	<71.9*	47.77	39.57	49.06	50.68	18.52	55.75
Hexachlorobenezene	0.71	0.32	0.79	0.97	0.32	0.47	0.72	<0.07	0.30	1.71
2,4,5-T(methyl ester)	3.38	2.52	2.70	2.19	2.36	1.80	2.60	2.94	1.18	1.71
Ovex	<1.35	<1.36	<1.27	<1.44	<1.27	<1.44	<1.51	<1.35	<1.35	<1.39
p,p'-DDT	4.73	4.08	<3.17	<3.60	<3.18	<3.60	3.77	<3.38	<3.37	<3.48

* - higher detection limit due to sample matrix interference.

TABLE 5.1-7

SITE INVESTIGATION
AMBIENT AIR RESULTS FOR PNA

DATE AND SAMPLE ID PARAMETERS	9-10-84 -0144-A-K	9-11-84 -0181-	9-12-84 -0182-	9-17-84 -0414-	9-19-84 -0597-	9-21-84 -0711-	9-24-84 -0714-	9-25-84 -0843-	10-3-84 -1084-	10-4-84 -1241-
PNA: (ng/m^3)										
Benzo(k)fluoranthene	0.51	0.63	1.01	0.80	1.41	0.72	1.24	1.35	0.73	1.35
Benzo(a)pyrene	0.54	0.67	3.01	0.90	2.50	1.66	2.28	1.10	0.76	2.79
Benzo(g,h,i)perylene	0.70	1.08	2.10	1.96	2.35	2.10	1.09	2.55	1.63	1.66
Indeno(1,2,3-c,d)pyrene (Coronene)	0.42	0.33	0.71	1.08	1.97	1.07	0.94	1.56	0.66	3.50
Phenanthrene	0.08	0.38	0.09	0.28	1.07	0.46	0.89	0.72	0.29	0.84
Triphenylene	0.38	0.36	1.50	0.38	0.86	0.31	0.68	0.80	0.29	0.59
Benzo(b)fluoranthene	1.00	0.86	1.62	0.97	1.97	0.91	1.66	1.55	0.52	1.89
Anthracene	0.06	0.05	0.21	0.05	0.17	0.06	0.11	0.09	0.02	0.12
Fluoranthene	1.36	1.18	6.66	1.01	2.69	1.07	2.26	2.01	0.54	2.32
Pyrene	1.19	1.16	1.76	1.13	2.42	1.47	1.86	2.01	0.53	1.54
Benzo(a)anthracene	0.78	0.65	0.56	0.76	1.45	0.59	1.22	1.28	0.37	1.38
Benzo(a,h)anthracene	2.05	2.34	2.90	2.79	*	1.27	2.72	2.39	1.04	2.11
Chrysene	0.73	0.63	0.54	0.58	1.39	0.53	1.12	1.32	0.33	1.17
Perylene	7.16	5.75	*	6.05	12.02	5.70	11.99	10.40	3.24	15.62

*Results not available as of February 14, 1985.

TABLE 5.2.1-1

INDUSTRIAL HYGIENE 2,3,7,8-TCDD MONITORING RESULTS

SAMPLE DESCRIPTION	RESULTS
IH-glass fiber filter: personnel sample	ND (0.41 ng/m^{3})
IH-glass fiber filter: hi vol, clean area sample	ND (0.20 ng/m^{3})
IH XAD2: backup to L0104	ND (0.27 ng/m^{3})
IH-glass fiber filter: blank	ND (0.80 ng/sample)
IH-XAD-2 tube field blank	ND (0.75 ng/sample)
IH-glass fiber filter-personnel sample	ND (1.6 ng/m^{3})
IH-GFF/XAD: 37-Cl sample spike	ND (1.2 ng/m^{3})
IH-glass fiber filter-Hi vol, btwn tanks, process building	ND (1.0 ng/m^{3})
IH-XAD: backup to L0161	ND (0.08 ng/m^{3})
IH-glass fiber filter-blank	ND (1.1 ng/sample)
IH-XAD-blank	ND (0.36 ng/sample)
IH-glass fiber filter-personnel sample	ND (0.34 ng/m^{3})
IH-glass fiber filter-field blank	ND (1.1 ng/sample)
IH-glass fiber filter-personnel sample	ND (0.10 ng/m^{3})
IH-personnel sample: drum sampler assistant	ND (0.55 ng/m^{3})
IH-personnel sample: driller (glass fiber filter)	ND (0.14 ng/m^{3})
IH-glass fiber filter: betwn tanks and process building	ND (0.16 ng/m^{3})
IH-XAD: backup to L0276	ND (0.37 ng/m^{3})
IH-glass fiber filter-field blank	ND (0.11 ng/sample)
IH-XAD: field blank	ND (1.1 ng/sample)
Glass fiber filter: personnel	ND (0.12 ng/m^{3})
Glass fiber filter: personnel	ND (0.91 ng/m^{3})
Glass fiber filter: personnel	ND (0.99 ng/m^{3})
Glass fiber filter field blank	ND (0.41 ng/sample)
IH-glass fiber filter-area decon	ND (0.16 ng/m^{3})
IH-XAD: backup to L0444	ND (0.55 ng/m^{3})
IH-glass fiber filter-personnel	0.74 ng/m^{3}
IH-glass fiber filter-field blank	ND (0.05 ng/sample)
IH-XAD2-field blank	ND (0.32 ng/sample)
IH-glass fiber filter-personnel	ND (0.31 ng/m^{3})
IH-glass fiber filter-field blank	ND (1.0 ng/sample)
IH-glass fiberfilter-personnel, chip sampler	1.2 ng/m^{3}
IH-glass fiber filter-personnel, driller	ND (0.26 ng/m^{3})
IH-glass fiber filter-field blank	ND (0.61 ng/sample)
IH-GFF/XAD: 37-Cl blank spike	ND (1.3 ng/sample)
IH-glass fiber filter-personnel, driller	ND (0.49 ng/m^{3})
IH-glass fiber filter-personnel, tank sampling	ND (0.74 ng/m^{3})
IH-XAD: backup to L0807	ND (0.55 ng/m^{3})
IH-glass fiber filter-field blank	ND (0.51 ng/sample)
IH-XAD: field blank	ND (0.68 ng/sample)

TABLE 5.2.1-1
(Continued)

SAMPLE DESCRIPTION	RESULTS
IH-glass fiber filter area	ND (1.01 ng/m^3)
IH-XAD2, area sample	ND (0.27 ng/m^3)
IH-glass fiber filter field blank	ND (0.5 ng/sample)
IH-XAD2 field blank	ND (0.55 ng/sample)
IH-glass fiber filter, personnel-drum crew	ND (2.02 ng/m^3)
IH-glass fiber filter, personnel-tank crew	ND (0.33 ng/m^3)
IH-glass fiberfilter, personnel-drillers	ND (2.9 ng/m^3)
IH-glass fiber filter-field blank	ND (0.4 ng/sample)
IH-glass fiber filter area	ND (0.28 ng/m^3)
IH-XAD2, area sample	ND (0.97 ng/m^3)
IH-XAD2, field blank	ND (2.7 ng/sample)
IH-glass fiberfilter, personnel-drums	ND (0.39 ng/m^3)
IH-glass fiber filter, personnel-tanks	ND (2.4 ng/m^3)
IH-glass fiber filter, field blank	ND (0.85 ng/sample)
IH-wipe: dcn line where personnel untape	52.2 ng/wipe
IH-wipe: stblz cloth in decon btwn brk area and D trlr	ND (16.4 ng/m^2)
IH-water: final rinse tub in decon line	0.02 ppb
IH-wipe: stblz cloth in frnt of sampl trlr steps	ND (26.8 ng/m^2)
IH-Glass fiber filter, personnel-tank	ND (0.49 ng/m^3)
IH-glass fiber filter, field blank	ND (0.93 ng/sample)
IH-wipe: frm samplg head of instrmt No. 15084 after decon	ND (11.2 ng/m^2)
IH-wipe: from ostd body of decon instrmt No. 15084	ND (4.8 ng/m^2)
IH-wipe: field blank	ND (3.8 ng/wipe)
IH-glass fiber filter, personnel, tank	26.3 ng/m^3
IH-glass fiber filter, personnel, tank	ND (4.5 ng/m^3)
IH-glass fiber filter, field blank	ND (11.1 ng/sample)
IH-wipe: wheel of drill rig after decon	ND (4.4 ng/m^2)
IH-wipe: back of drill rig on steel plates after decon	84. ng/m^2
IH-wipe, field blank	ND (1.5 ng/wipe)
IH-glass fiber filter-frnt personnel drl rig dcn	98.9 ng/m^3
IH-glass fiber filter-bck personnel drl rig dcn	8.9 ng/m^3
IH-glass fiber filter-field blank	ND (3.2 ng/sample)
IH-glass fiber filter-area onstd dcn tent-drl rig	ND (18.1 ng/m^3)
IH-XAD2-area ostd decon tent for drill rig	ND (9.6 ng/m^3)
IH-XAD2- field blank	ND (52 ng/sample)
IH-glass fiber filter, personnel-soil crew	1.8 ng/m^3
IH-glass fiber filter, personnel-soil crew	1.7 ng/m^3
IH-wipe: bck of drl rig-dck stl plt-right side	72 ng/m^2
IH-wipe: steel high pressure air bottle	18 ng/m^2
IH-wipe: MSA air hose	124 ng/m^2
IH-wipe: steam jenny heater tower	8.4 ng/m^2
IH-wipe-field blank	ND (4.1 ng/wipe)

TABLE 5.2.3-1

SUMMARY OF ORGANIC COMPOUNDS, ASBESTOS, AND SULFURIC ACID RESULTS IN INDUSTRIAL HYGIENE MONITORING SAMPLES

PARAMETER	CONCENTRATION RANGE	NUMBER OF POSITIVE RESULTS	NUMBER OF SAMPLES ANALYZED
2,4-D	ND	0	1
2,4,5-T	ND	0	1
Asbestos	0-0.09 fibers/cm^3	1	2
Sulfuric Acid	0.022 mg/m^3	1	1
Toluene(1)	0.097-0.099 mg/m^3	3	4
1,2-Dichloroethane	0.099 mg/m^3	1	4
Tetrachloroethane	1.44 mg/m^3	1	4
1,1,1-Trichloroethane	1.98 mg/m^3	1	4
Trichloroethylene	1.08 mg/m^3	1	4
1,1,2-trichloro-1,2,2-trifluoroethane	8.1 mg/m^3	1	4

(1) Toluene was also detected in field blank sampling tubes at comparable levels.

TABLE 5.3-1

SUMMARY OF ASBESTOS ANALYSIS
BUILDINGS AND STRUCTURES

LOCATION	NUMBER OF SAMPLES	NUMBER OF POSITIVE RESULTS	RANGE OF RESULTS IN (%) BY ASBESTOS FORM	
			CHRYSOTILE	AMOSITE
Lab	4	3	<1-26	-
Warehouse	3	1	25	4
Manufacturing Building	2	1	15	-
Process Building	3(1)	2	14	5
Tank Farm	2	2	16	6.5
TOTALS	14	9	<1-25	4-6.5

(1) One sample lost in transit.

TABLE 5.3-2

ASBESTOS ANALYSIS RESULTS
BUILDINGS AND STRUCTURES

SAMPLE NUMBER	DESCRIPTION	RESULTS (%)
MANUFACTURING BUILDING		
3100-1306-B-C	Mftg. Bldg., First Floor, Piping Insulation	Chrysotile 15
3100-1307-B-C	Mftg. Bldg., Boiler Room, Piping Insulation	None
PROCESS BUILDING		
4100-1305-B-C	Process Building, Fist Floor, Piping Insulation	Chrysotile 14
4100-0593-B-C	Process Building, First Floor, Piping Insulation	Amosite 5
4100-0594-B-C	Process Building, First Floor, Vessel Piping Insulation	Sample Lost
TANK FARM		
9500-1304-B-C	Northwest Tank Farm Piping Insulation	Amosite 6.5
9500-1308-B-C	Southeast Tank Farm Piping Insulation	Chrysotile 16
WAREHOUSE		
2100-0281-B-C	Warehouse, Room 2100, Insulation From Pipe	None
2100-0282-B-C	Warehouse, Room 2100, Wall	Chrysotile 25 Amosite 4
2109-1303-B-C	Warehouse, Room 2109, Insitn Piping, Shop Area	None
LAB		
1205-0070-B-C	Lab Room, 1205, Pile on Floor, Utility Room	Chrysotile 6
1205-0071-B-C	Lab Room, 1205, Ductwork Insulation	Chrysotile TR <1
1205-0072-B-C	Lab Room, 1205, Around Furnace, Utility Room	Chrysotile 26
1205-0094-B-C	Lab Room, 1205, A/C Filter duct, Inlet	None

TABLE 5.3-3

SUMMARY OF 2,3,7,8-TCDD RESULTS
BUILDINGS AND STRUCTURES

	WIPES			CHIPS			BULK		
LOCATION	NUMBER OF SAMPLES	NUMBER OF POSITIVE ANALYSES	RANGE OF CONCENTRATION (ng/m^2)	NUMBER OF SAMPLES	NUMBER OF POSITIVE ANALYSES	RANGE OF CONCENTRATION (ppb)	NUMBER OF SAMPLES	NUMBER OF POSITIVE ANALYSES	RANGE OF CONCENTRATION (ppb)
Office and Laboratory	24(1)	22	10-14,000	16	10	0.57-69.3	-	-	-
Warehouse	8	8	13-19,000	16	13	1.0-192	-	-	-
Manufacturing Building	5	4	233-7,000	23	23	0.93-1,280	-	-	-
Process Building	14	14	6.4-41,600	10	10	2.7-1,580	5	5	3.0-128
Other Structures	-	-	-	6	6	1.2-50.0	1	1	0.17
TOTAL	51	48	6.4-41,600	71	62	0.57-1,580	6	6	0.17-128

(1) One sample void

TABLE 5.3-4

2,3,7,8-TCDD SAMPLE REANALYSIS SUMMARY BUILDINGS AND STRUCTURES

SAMPLE IDENTIFICATION	LOCATION	SAMPLE TYPE	INITIAL RESULTS (ppb)/ng/m^2	ACTION	REANALYSIS RESULTS (ppb)/ng/m^2
2109-0178-W-L	Warehouse	Wipe	25,000	10:1 dilution	19,000
4504-0452-C-L	Process	Chip	(>938)	1 gram	(1,580)
4100-0553-C-L	Process	Chip	(1,678)	1 gram	(696)
4100-0554-C-L	Process	Chip	(529)	1 gram	(445)
4100-0560-W-L	Process	Wipe	137,000(a)	100:1 dilution	29,200
4100-0560-W-L	Process	Wipe	38,900	10:1 dilution	41,600
3100-0621-C-L	Manufacturing	Chip	(1,316)	1 gram	(1,280)
3100-0633-C-L	Manufacturing	Chip	(402)	1 gram	(447)
3100-0634-C-L	Manufacturing	Chip	(b)	1 gram	(502)
3200-0654-C-L	Manufacturing	Chip	(1,000)	1 gram	(896)

(a) Extremely high matrix interference and saturation.

(b) Instrument detector saturated - no results available.

TABLE 5.3.1-1

2,3,7,8-TCDD SAMPLE ANALYSIS

OFFICE AND LABORATORY BUILDING

SAMPLE NUMBER	DESCRIPTION	RESULTS
<u>WIPE SAMPLES</u>		
1100-0016-W-L	Lab Room 1100, Main Entrance	76 ng/m^2
1102-0017-W-L	Lab Room 1102, Accounting	38 ng/m^2
1105-0018-W-L	Lab Room 1105, Floor, Plant Manager	100 ng/m^2
1106-0021-W-L	Lab Room 1106, Floor, Back Foyer Inside Door	500 ng/m^2
1107-0020-W-L	Lab Room 1107, Floor	100 ng/m^2
1108-0019-W-L	Lab Room 1108, Wall	480 ng/m^2
1116-0034-W-L	Lab Room 1116, Locker Room	500 ng/m^2
1122-0035-W-L	Lab Room 1122, Heater Duct, Basket Room	120 ng/m^2
1122-0073-W-L	Lab Room 1122, Windowsill, Basker Room	520 ng/m^2
1122-0074-W-L	Lab Room 1122, Floor Near Inside Entrance	1,100 ng/m^2
1202-0032-W-L	Lab Room 1202, Floor, Lunchroom	56 ng/m^2
1202-0033-W-L	Lab Room 1202, Radiator, Lunchroom	18 ng/m^2
1204-0023-W-L	Lab Room 1204, Floor by Back Door, Lab	150 ng/m^2
1204-0024-W-L	Lab Room 1204, Lab Hood, Lab	14,000 ng/m^2
1204-0025-W-L	Lab Room 1204, North Side of Entrance, Lab Side	10 ng/m^2
1204-0026-W-L	Lab Room 1204, Bench Near Back Door	1,000 ng/m^2
1205-0030-W-L	Lab room 1205, A/C Intake Duct, Utility	1,200 ng/m^2
1205-0031-W-L	Lab Room 1205, Furnace Intake, Utility Room	88 ng/m^2
1205-0095-W-L	Lab Room 1205, Heater Interior Inlet, Utility	1,400 ng/m^2
1206-0027-W-L	Lab Room 1206, Floor, Small Lab	350 ng/m^2
1206-0028-W-L	Lab Room 1206, Bench, Small Lab	Void:sample lost
1206-0381-W-L	Office/Lab Room 1206, Bench, Small Lab	150 ng/m^2
1506-1590-W-L	Office Lab, West Wall, at Roof	168 ng/m^2
1506-0101-W-L	Office Lab, Center of West Wall, at Roof	ND (3.2 ng/m^2)

TABLE 5.3.1-1
(Continued)

SAMPLE NUMBER	DESCRIPTION	RESULTS
CHIP SAMPLES		
1118-0049-C-L	Lab Room 1118, Floor Under Sink Edge, Washroom	2.0 ppb
1119-0050-C-L	Lab room 1119, Floor Slop Sink	3.7 ppb
1122-0051-C-L	Lab Room 1122, Floor Under Arch Between Room 1122 and 1116	25.0 ppb
1122-0052-C-L	Lab Room 1122, Floor Near Drain, Basket Room	69.3 ppb
1122-0053-C-L	Lab Room 1122, Floor Near Back Door, Basket Room	61.2 ppb
1501-0098-C-L	Lab Exterior, 1501, Center, North Wall at Roofsill	ND (0.10 ppb)
1501-0111-C-L	Lab Exterior, 1501, Center of North Wall, 3 to 5 feet	0.70 ppb
1501-0112-C-L	ITAS Split of 1501-0111-C-L	0.95 ppb
1501-0113-C-L	Lab Exterior, 1501, Center North Wall, Ground Level	0.57 ppb
1505-0097-C-L	Lab Exterior, 1505, South Corner, East Wall at Roofsill	ND (0.08 ppb)
1505-0108-C-L	Lab Exterior, 1505, South Corner, East Wall, 3 to 5 feet	ND (0.63 ppb)
1505-0109-C-L	Lab Exterior, 1505, South Corner, East Wall, Ground Level	ND (0.25 ppb)
1505-0110-C-L	Lab Exterior, 1505, Walkway of Front Entrance	2.3 ppb
1506-0099-C-L	Lab Exterior, 1506, Center West Wall, Top 24-inch Vertical	ND (0.34 ppb)
1506-0166-C-L	Lab Exterior, 1506, Center West Wall, 3 to 5 feet	ND (0.58 ppb)
1506-0167-C-L	Lab Exterior, 1506, Center West Wall, Ground Level	2.4 ppb

TABLE 5.3.2-1

2,3,7,8-TCDD SAMPLE ANALYSIS
WAREHOUSE

SAMPLE NUMBER	DESCRIPTION	RESULTS
WIPE SAMPLES		
2100-0218-W-L	Warehouse, Room 2100, Top of Fluorescent	8,120 ng/m^2
2103-0217-W-L	Warehouse, Room 2103, Floor, Foreman's Office	1,810 ng/m^2
2108-0176-W-L	Warehouse, Room 2108, Floor, Kitchen	600 ng/m^2
2108-0177-W-L	Warehouse, Room 2108, Windowsill, Kitchen	130 ng/m^2
2109-0178-W-L	Warehouse, Room 2109, Top of Light Work Area, Shop	19,000 ng/m^2
2109-0179-W-L	Warehouse, Room 2109, Top of Bench in Shop	3,500 ng/m^2
2200-0180-W-L	Warehouse, Room 2200, Top of Beam in Storage Area	8,000 ng/m^2
2400-0315-W-L	Warehouse, West End, Roof	13 ng/m^2
CHIP SAMPLES		
2100-0168-C-L	Warehouse, Room 2100, Center of Traffic Area, Floor	54.6 ppb
2109-0169-C-L	Warehouse, Room 2109, Floor, Tool Crib Cage Area	48.7 ppb
2109-0170-C-L	Warehouse, Room 2109, Floor By Traffic Door	121 ppb
2109-0171-C-L	Warehouse, Room 2109, Floor by Warehouse Door	192 ppb
2501-0317-C-L	Warehouse, North Wall at Ground Level	4.4 ppb
2501-0391-C-L	Warehouse North Wall at 60 inches (3 to 5 feet)	1.6 ppb
2501-0392-C-L	Warehouse Exerior, North Side at Roof	1.9 ppb
2502-0319-C-L	Warehouse, South Wall at Ground Level	10 ppb
2502-0393-C-L	Warehouse, South Wall at 60 inches (3 to 5 feet)	13.3 ppb
2502-0529-C-L	Warehouse, Exterior, South Wall, at Roof Line	16.5 ppb
2504-0318-C-L	Warehouse, East Wall at Ground Level	3.1 ppb

TABLE 5.3.2-1
(Continued)

SAMPLE NUMBER	DESCRIPTION	RESULTS
CHIP SAMPLES (Continued)		
2504-0527-C-L	Warehouse, Exterior, East Wall, 3 to 5 feet	1.4 ppb
2504-0528-C-L	Warehouse, Exterior, East Wall, at Roof Line	1.0 ppb
2506-0316-C-L	West Wall at Ground Level	ND(0.57 ppb)
2506-0389-C-L	Warehouse, West Wall at 60 inches (3 to 5 feet)	ND (0.77 ppb)
2506-0390-C-L	Warehouse, West Wall at Roof Line	ND (0.28 ppb)

TABLE 5.3.3-1

2,3,7,8-TCDD SAMPLE ANALYSIS

MANUFACTURING BUILDING

SAMPLE NUMBER	DESCRIPTION	RESULTS
WIPE SAMPLES		
3100-0658-W-L	Mftg. Bldg., First Floor, Packing Area, Rafter	233 ng/m^2
3200-0655-W-L	Mftg. Bldg., Second Floor, New Addition, Floor, South End	7,000 ng/m^2
3200-0656-W-L	Mftg. Bldg., Second Floor, New Addition, Panel, Center	1,100 ng/m^2
3200-0657-W-L	Mftg. Bldg., Second Floor, New Addition, North End, Beam	630 ng/m^2
3502-0716-W-L	Mftg. Bldg., South Exterior Door	ND (77.5 ng/m^2)
CHIP SAMPLES		
3100-0619-C-L	Mftg. Bldg., Old Area, Roof Slab, South of Center Vessel	1.1 ppb
3100-0620-C-L	Mftg. Bldg., Old Area, Roof Slab, West of North Vessel	12.3 ppb
3100-0621-C-L	Mftg. Bldg., Bulk Debris from Drain Area	1,280 ppb
3100-0622-C-L	Mftg. Bldg., Old Area, 1st Floor, Floor North End North Room	91.8 ppb
3100-0633-C-L	Mftg. Bldg., Old Area, Floor, Center	447 ppb
3100-0634-C-L	Mftg. Bldg., Old Area, Floor, South	502 ppb
3100-0635-C-L	Mftg. Bldg., Packing Area, Floor at Main Door	210 ppb
3100-0636-C-L	Mftg. Bldg., Packing Area, Floor at Packing Chute	191 ppb
3100-0639-C-L	Mftg. Bldg., Packing Area, Low on East Wall	6.0 ppb
3100-0640-C-L	Mftg. Bldg., Packing Area, 30 to 60 inches on West Wall	18.1 ppb
3100-0641-C-L	Mftg. Bldg., New Addition, Southwest Wall, Interior	62.1 ppb
3100-0652-C-L	Mftg. Bldg., First Floor, Southwest Floor Under Vessel	5.1 ppb
3100-0653-C-L	Mftg. Bldg., First Floor, New Addition, Center Floor by Pump	22.5 ppb
3200-0654-C-L	Mftg. Bldg., Second Floor, New Addition, North Wall by Door	896 ppb

TABLE 5.3.3-1
(Continued)

SAMPLE NUMBER	DESCRIPTION	RESULTS
CHIP SAMPLES (Continued)		
3501-0690-C-L	Mftg. Bldg., Exterior, North Wall, 0 to 24 inches by Main Door	203 ppb
3501-0691-C-L	Mftg. Bldg., Exterior, North Wall, 36 to 60 inches by Main Door	167 ppb
3502-0696-C-L	Mftg. Bldg., Exterior, South, Under Load-Out Door	200 ppb
3502-0697-C-L	Mftg. Bldg., Exterior, South Wall, 0 to 24 inches, Package Area Door	6.9 ppb
3502-0698-C-L	Mftg. Bldg., Exterior, South Wall, 36 to 60 inches, Package Area Door	26.6 ppb
3506-0692-C-L	Mftg. Bldg., Exterior, West Wall, 0 to 24 inches, by Large North Door	59.8 ppb
3506-0693-C-L	Mftg. Bldg., Exterior, West Wall, 36 to 60 inches, by Large North Doorway	12.2 ppb
3506-0694-C-L	Mftg. Bldg., Exterior, West Wall, 0 to 24 inches, by South Stairway	3.1 ppb
3506-0695-C-L	Mftg. Bldg., Exterior, West Wall, 36 to 60 inches, by South Stairway	0.93 ppb

TABLE 5.3.4-1

2,3,7,8-TCDD SAMPLE ANALYSIS

PROCESS BUILDING

SAMPLE NUMBER	DESCRIPTION	RESULTS
WIPE SAMPLES		
4100-0556-W-L	Process Bldg., East End, Near Vessel, Top of Light, First Floor	1,970 ng/m^2
4100-0557-W-L	Process Bldg., East End, Low on Column, Near Vessel, First Floor	4,040 ng/m^2
4100-0558-W-L	Process Bldg., Center, First Floor, Top of Light, Near Vessel	1,200 ng/m^2
4100-0559-W-L	Process Bldg., Center, First Floor, Low on Column, Near Vessel	29,200 ng/m^2
4100-0560-W-L	Process Bldg., West End, First Floor, Top of Light, Near Vessel	41,600 ng/m^2
4100-0561-W-L	Process Bldg., West End, First Floor, Low on Column, Near Vessel	9,070 ng/m^2
4200-0608-W-L	Process Bldg., Second Floor, West End Interior Wall	1,200 ng/m^2
4200-0609-W-L	Process Bldg., Second Floor, Acid Room Wall (Interior)	380 ng/m^2
4200-0610-W-L	Process Bldg., Second Floor, East End Interior Wall	270 ng/m^2
4300-0611-W-L	Process Bldg., Third Floor, East End Interior Wall	3,100 ng/m^2
4300-0612-W-L	Process Bldg., Third Floor, Surface, Center	170 ng/m^2
4300-0613-W-L	Process Bldg., Third Floor, Surface, East End	60 ng/m^2
4400-0495-W-L	Process Bldg., Roof, Northeast Quadrant	6.4 ng/m^2
4400-0496-W-L	Process Bldg., Roof, Southwest Corner	12 ng/m^2
CHIP SAMPLES		
4100-0553-C-L	Process Bldg., Floor, West End of First Floor	696 ppb
4100-0554-C-L	Process Bldg., Floor at Loading Door, First Floor	445 ppb
4100-0555-C-L	Process Bldg., Floor, East End Under Vessel, First Floor	43.2 ppb
4501-0424-C-L	Process Bldg., Exterior, North Wall, 0 to 24 inches	45 ppb
4501-0428-C-L	Process Bldg., In Bin, North, 0 to 24 Inches	37.0 ppb

TABLE 5.3.4-1
(Continued)

SAMPLE NUMBER	DESCRIPTION	RESULTS
CHIP SAMPLES (Continued)		
4502-0451-C-L	Process Bldg., South Wall, Near Roof at Vert Stairs	76.8 ppb
4503-0427-C-L	Process Bldg., Exterior, South at C Filter, 24 inches Over Curb	67.9 ppb
4504-0452-C-L	Process Bldg., East Wall, Over Trench Near Vessels (0 to 24 inches)	1,580 ppb
4506-0425-C-L	Process Bldg., Exterior Bin Wall, West Side, 0 to 24 inches	2.7 ppb
4506-0426-C-L	Process Bldg., Exterior, Bin Wall, West Side, 36 to 60 inches	2.9 ppb
BULK SAMPLES		
4501-0455-B-L	Process Bldg., North Wall, 36 to 60 inches	128 ppb
4501-0493-B-L	Process Bldg., North Wall, 24 inches from top (Off Louvers)	3.0 ppb
4503-0456-B-L	Process Bldg., South Wall, 36 to 60 inches	8.1 ppb
4504-0453-B-L	Process Bldg., East Wall, Near Vessels (36 to 60 inches)	95.4 ppb
4504-0454-B-L	Process Bldg., East Wall, at Roof Near Vessels	78.3 ppb

TABLE 5.3.5-1

2,3,7,8-TCDD RESULTS
OTHER STRUCTURES

SAMPLE NUMBER	DESCRIPTION	RESULTS
CHIP SAMPLES		
5001-0277-C-L	Stack Flue, Soot at Furnace Entrance	10.5 ppb
5002-0278-C-L	Stack, Soot from Base of Inside Dropout Chamber	9.2 ppb
5003-0279-C-L	Stack, Exterior at Base, 0 to 24 inches Vertical	1.2 ppb
6100-0388-C-L	Solvent Shed Interior Floor	9.0 ppb
6200-0618-C-L	Pump House, Interior, Floor	50.0 ppb
6600-0617-C-L	Pump House, Exterior, 0 to 24 inches	5.3 ppb
BULK SAMPLES		
6500-0280-B-L	Solvent Shed Exterior, Insulating Panel	0.17 ppb

TABLE 5.3.6-1

2,3,7,8-TCDD
ANALYSIS RESULTS OF TANK SAMPLES

SAMPLE NUMBER	DESCRIPTION	RESULTS (ppb)
7037-1206-N-L	Tank No. 37, Bulk, reddish-brown sediment	No recovery(1)
7041-1192-N-L	Tank No. 41, Bulk, pink-hardened clay	No recovery(1)
7057-1258-N-L	Tank No. 57, Bulk, whitish-grey solid	5.0
7063-1264-N-L	Tank No. 63, Bulk, white powder	100
7094-1410-N-L	Tank No. 94, Bulk, greyish-green solid	236
7112-1523-N-L	Tank No. 112, Bulk, orange liuqid	No recovery(2)
7118-1526-N-L	Tank No. 118, Wipe, glass lined	8.2
7126-1539-N-L	Tank No. 126, Bulk, rusty-brown solid	5530
7127-1540-N-L	Tank No. 127, Bulk, red crystals	4200
7129-1548-N-L	Tank No. 129, Bulk, brown, black-rusty solid	679
7135-1620-N-L	Tank No. 135, Bulk, rusty-brown powder	60,800
7136-1635-N-L	Tank No. 136, Bulk, red-rusty solid	11.1

(1) Three analyses attempted no known method available.

(2) No sample available for reanalysis.

TABLE 5.3.6-2

SUMMARY OF 2,3,7,8-TCDD REANALYSIS RESULTS

SAMPLE IDENTIFICATION	INITIAL RESULTS	ACTION	REANALYSIS RESULTS
7126-1539-N-L	6,570	1 gram 5:1	5,530
7127-1540-N-L	6,060	1 gram 5:1	4,200
7129-1548-N-L	560	1 gram	679
7135-1620-N-L	>106,000	1 gram 20:1	60,800

TABLE 5.4-1

SEWERS AND SUMPS
2,3,7,8-TCDD RESULTS SUMMARY

ANALYSIS LOCATION	NUMBER OF SAMPLES	NUMBER OF POSITIVE RESULTS	RANGE OF CONCENTRATION (ppb)
Sewers	4	4	195-4,040
Sumps			
Manufacturing Building	5	5	105-2,950
Process Building	3	3	350-9,160
TOTAL	12	12	19.5-9,160

TABLE 5.4-2

2,3,7,8-TCDD RESULTS
SEWERS AND SUMPS

SAMPLE NUMBER	DESCRIPTION	RESULTS
<u>SEWER SAMPLES</u>		
8007-1256-Z-L	12 Feet South of Southwest Corner of Manufacturing Building	19.5 ppb
8010-1286-Z-L	25 Feet North of 15 Feet Southwest Outside Wall at Manufacturing Building	4,040 ppb
8011-1287-Z-L	Directly 20 Feet South of Tank No. 23 Near Warehouse	420 ppb
8012-1323-Z-L	50 Feet Northeast of Office Lab	529 ppb
<u>SUMP SAMPLES</u>		
8001-1231-Z-L	Mftg. Bldg., First Floor, West Wall Next to Rollup Door	2,950 ppb
8002-1232-Z-L	Mftg. Bldg., First Floor, West Side, North of Rollup Door	1,010 ppb
8003-1233-Z-L	Mftg. Bldg., First Floor, Southeast Side, Floor Sump, North Sliding Doors	105 ppb
8004-1234-Z-L	Outside Process Building, East Wall, Floor Sump	350 ppb
8005-1254-Z-L	Outside Wall of Process Building, 30 Feet West of Tank 2099	2,680 ppb
8006-1255-Z-L	Outside Northwest Corner Process Bldg., Five Feet East of Back Stairway	9,160 ppb
8008-1284-Z-L	15 Feet Northwest of Southwest Corner of Manufacturing Building	560 ppb
8009-1285-Z-L	60 Feet North of Outside Southwest Corner of Manufacturing Building	836 ppb

TABLE 5.4-3

SEWER AND SUMP SAMPLE
2,3,7,8-TCDD
REANALYSIS RESULTS SUMMARY

SAMPLE NUMBER	INITIAL RESULTS (ppb)	ACTION	REANALYSIS RESULTS (ppb)
8001-1231-Z-L	>1,140	1 gram	2,950
8002-1232-Z-L	>1,623	1 gram	1,010
8004-1234-Z-L	>361	1 gram	350
8005-1254-Z-L	>2,302	1 gram	2,680
8006-1255-Z-L	>5,530	Dilution 50:1	9,160
8008-1284-Z-L	>1,280	1 gram	560
8010-1286-Z-L	>3,660	Dilution	4,040
8011-1287-Z-L	>567	1 gram	420
8012-1323-Z-L	>386	1 gram	529

TABLE 5.5.2-1

DESIGNATED ANALYSIS FOR NEAR-SURFACE AND BORING SOIL SAMPLES

SAMPLE ELEVATION CODE	RELATIVE SAMPLE DEPTH (inches)	ANALYSES DESIGNATED	
		NSSS	BSS
100	0-6	Priority Pollutants[2]	Priority Pollutants
101	6-12	Dioxin[2]	Dioxin
102	12-24	Priority Pollutants	Priority Pollutants
103-108		(24-60") Samples archived	(24"-last increment above silt) Samples archived
109	above silt zone	-	Total
201	silt zone	-	Dioxin

(1) Priority pollutant refers to the analysis and compounds contained therein as described by priority pollutants (HSL compound) for acid/base/neutrals; volatile organic compounds, pesticides and PCB, metals, total cyanide, total phenols, herbicides (8150), 2,3,7,8-tetrachlorodibenzo-p-dioxin.

(2) Dioxin refers to the analysis for 2,3,7,8-tetrachlorodibenzo-p-dioxin.

TABLE 5.5.2.1-1

COLLECTED NEAR-SURFACE SOIL SAMPLES

DEPTH (inches)	ELEVATION CODE	NUMBER OF SAMPLES
0-6	100	21
6-12	101	21
12-24	102	21
24-36	103	21
36-48	104	17
48-60	105	14
TOTAL		115

TABLE 5.5.2.1-2

NEAR-SURFACE SOIL SAMPLE 2,3,7,8-TCDD REANALYSIS SUMMARY

STATION NUMBER	DEPTH (inches)	ELEVATION CODE	INITIAL RESULTS (ppb)	CORRECTIVE ACTION	REANALYSYS RESULTS (ppb)
A-2-G	0-6	100	296	1 gram	326
A-2-G	6-12	101	289	1 gram	330
A-5-G	0-6	100	500	1 gram	695
A-5-G	6-12	101	460	1 gram	453
F-5-E	0-6	100	268	1 gram	470
F-5-E	6-12	101	247	1 gram	394
F-5-E	12-24	102	>19,000	1 gram, dilution 10:1	19,500
G-3-I	0-6	100	1,110	1 gram	1,010
G-3-L	0-6	100	261	1 gram	310
G-4-A	0-6	100	395	1 gram	276
G-4-A	6-12	101	>3,130	1 gram, dilution 3:1	3,690
G-4-A	12-24	102	>1,515	1 gram	1,770
G-5-F	0-6	100	325	1 gram	361
G-5-F	6-12	101	359	1 gram	494
H-2-H	0-6	100	>1,586	1 gram	2,390
H-2-H	6-12	101	1,180	1 gram	1,230
H-2-H	12-24	102	286	1 gram	510
H-5-F	12-24	102	336	1 gram	385
H-7-F	0-6	100	>5,768	1 gram, dilution 5:1	9,050
H-7-F	6-12	101	>1,550	1 gram	2,730
H-7-F	12-24	102	231	1 gram	200

TABLE 5.5.2.1-3

NEAR-SURFACE SOIL SAMPLE
2,3,7,8-TCDD RESULTS
(µg/kg or ppb)

SAMPLE ELEVATION CODE	DEPTH (inches)	GRID LOCATIONS																				
		A-2-G	A-4-F	A-5-G	B-2-M	C-6-B	D-4-N	E-1-G	E-5-D	F-5-E	G-3-I	G-3-L	G-4-A	G-5-E	G-5-F	H-1-H	H-2-B	H-2-H	H-5-F	H-7-F	H-7-H	J-6-K
100	0-6	326	0.39	695	143	3.6	3.6	153	40.4	470	1,010	310	276	221	361	58.6	93.5	2,390	28.5	9,050	29.5	2.5
101	6-12	330	1.2	453	11.1	87.5	2.3	4.2	14.4	394	96.3	126	3,690	217	494	30.9	47.0	1,230	69.3	2,730	27.6	1.6
102	12-24	214	7.1	7.3	2.8	12.2	1.2	8.6	10.8	19,500	26.0	33.4	1,770	87 6	229	22.2	177	510	385	200	226	0.92
103	24-36	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
104	36-48	A	A	A	A	R	A	A	A	A	R	A	A	A	A	A	A	R	A	A	R	A
105	48-60	A	A	A	A	R	R	R	A	A	R	A	A	A	A	A	A	R	R	A	R	A

A = the sample was archived for possible future analysis.

R = refusal, thus a sample was not recovered.

TABLE 5.5.2.1-4

NEAR-SURFACE SOILS
ORGANIC PRIORITY POLLUTANT ANALYSIS LEVELS

STATION	DEPTH (inches)	VOA	BASE/NEUTRAL/ACID	PESTICIDE	HERBICIDE
A-2-G	0-6	Low	Medium	Medium(1)	Low(2)
A-2-G	12-24	Low	Medium	Medium(3)	Low(2)
A-4-F	0-6	Low	Low	Low(7)	Low
A-4-F	12-24	Low	Medium	Medium(7)	Low
A-5G	0-6	Low	Low	Low(6)	Low(2)
A-5G	12-24	Low	Medium	Medium	Low
B-2-M	0-6	Low	Medium	Medium(4)	Low(2)
B-2-M	12-24	Low	Low	Low(5)	Low(2)
C-6-B	0-6	Low	Low	Low	Low
C-6-B	12-24	Medium(4)	Medium	Medium	Low(5)
D-4-N	0-6	Low	Low	Low(7)	Low
D-4-N	12-24	Low	Low	Low(7)	Low
E-1-G	0-6	Low	Low	Low(5)	Low
E-1-G	12-24	Low	Medium	Medium(4)	Low
E-5-D	0-6	Low	Medium	Medium(7)	Low(2)
E-5-D	12-24	Low	Low	Low(8)	Low(2)
F-5-E	0-6	Low	Low	Low(6)	Low(2)
F-5-E	12-24	Low	Medium	Medium(6)	Low(3)
G-3-I	0-6	Low	Low	Low(6)	Low(2)
G-3-I	12-24	Low	Low	Low(7)	Low(2)
G-3-L	0-6	Low	Low	Low(12)	Low(2)
G-3-L	12-24	Low	Low	Low(9)	Low(2)
G-4-A	0-6	Low	Low	Low(9)	Low(2)
G-4-A	12-24	Low	Medium	Medium(6)	Low(2)
G-5-E	0-6	Low	Low	Low(6)	Low(2)
G-5-E	12-24	Low	Low	Low(6)	Low(2)
G-5-F	0-6	Low	Low	Low(6)	Low(2)
G-5-F	12-24	Low	Medium	Medium(6)	Low(9)

TABLE 5.5.2.1-4
(Continued)

STATION	DEPTH (inches)	VOA	BASE/NEUTRAL/ACID	PESTICIDE	HERBICIDE
H-1-H	0-6	Low	Low	Low(6)	Low(2)
H-1-H	12-24	Low	Low	Low(4)	Low
H-2-B	0-6	Low	Medium	Medium(4)	Low(9)
H-2-B	12-24	Low	Medium	Medium(9)	Low(9)
H-2-H	0-6	Low	Medium	Medium(6)	Low(6)
H-2-H	12-24	Low	Medium	Medium(6)	Low(10)
H-5-F	0-6	Low	Low	Low(6)	Low
H-5-F	12-24	Low	Medium	Low(7)	Low(2)
H-7-F	0-6	Medium	Medium(4)	Medium(1)	Low(11)
H-7-F	12-24	Low(4)	Medium	Medium(7)	Low(1)
H-7-H	0-6	Low	Low	Low(7)	Low(2)
H-7-H	12-24	Medium	Medium(7)	Medium(1)	Low(1)
J-6-K	0-6	Low	Low	Low(7)	Low(2)
J-6-K	12-24	Low	Low	Low	Low(2)

(1)Further dilution 1:1000

(2)Further dilution 1:5

(3)Further dilution 1:500

(4)Further dilution 1:20

(5)Further dilution 1:40

(6)Further dilution 1:100

(7)Further dilution 1:10

(8)Further dilution 1:250

(9)Further dilution 1:50

(10)Further dilution 1:25

(11)Further dilution 1:10,000

(12)Further dilution 1:5000

TABLE 5.5.2.1-5

SUMMARY OF DETECTED BASE/NEUTRAL/ACID ORGANIC COMPOUNDS
NEAR-SURFACE SOILS
(Expressed as µg/kg or ppb)

	0-6 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
2,4,6-Trichlorophenol	1,500,000-1,300	5	21	1,700,000-8,700	4	21
2,4-Dichlorophenol	3,600,000-980	7	21	2,500,000-870	8	21
2,4-Dimethylphenol	-	0	21	1,700,000	1	21
Benzoic Acid	1,800	1	21	-	0	21
2,4,5-Trichlorophenol	15,000,000-870	5	21	7,500,000-2,500	5	21
Acenaphthene	250	1	21	-	0	21
1,2,4-Trichlorobenzene	17,000-1,500	2	21	19,000	1	21
Hexachlorobenzene	110,000-560	13	21	720,000-3,200	9	21
1,2-Dichlorobenzene	520-230	2	21	9,000	1	21
1,3-Dichlorobenzene	-	0	21	610	1	21
1,4-Dichlorobenzene	1,400-470	3	21	1,300	1	21
Fluoranthene	6,100-330	5	21	64,000-670	6	21
Naphthalene	200	1	21	8,200	1	21
Bis(2-ethylhexyl)phthalate	1,300-310	3	21	310,000-5,100	3	21
Di-N-butylphthalate	-	0	21	370,000-2,000	2	21
Benzo(a)anthracene	47,000-910	3	21	47,000-510	5	21

TABLE 5.5.2.1-5

(Continued)

	0-6 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	NUMBER CONCENTRATION RANGE RESULTS	NUMBER POSITIVE ANALYZED	SAMPLES
Benzo(a)pyrene	4,800-1,000	3	21	44,000-560	5	21
Benzo(b)fluoranthene	7,100-2,100	3	21	71,000-940	5	21
Chrysene	12,000-2,600	2	21	120,000-1,400	6	21
Acenaphthylene	690-210	2	21	860-240	2	21
Anthracene	3,000-310	4	21	1,200-630	3	21
Benzo(g,h,i)perylene	11,000-3,300	3	21	32,000	1	21
Fluorene	320	1	21	300-250	2	21
Phenanthrene	4,100-250	5	21	61,000-440	6	21
Indeno(1,2,3,-CD)-pyrene	2,500-2,200	2	21	21,000-480	2	21
Pyrene	2,200-230	6	21	78,000-280	7	21
Dibenzofuran	-	0	21	450	1	21
2-Methylnaphthalene	220	1	21	21,000	1	21

TABLE 5.5.2.1-6

SUMMARY OF DETECTED VOLATILE ORGANICS
NEAR-SURFACE SOILS
(Expressed as μg/kg or ppb)

	0-6 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzene	21	1	21	23,000-11	3	21
Chlorobenzene	84,000-39	2	21	170,000-22	6	21
Chloroform	38	1	21	38,000-13	2	21
Ethylbenzene	-	0	21	60,000	1	21
Methylene chloride	1,500-14	21	21	130,000-21	21	21
Tetrachloroethane	860	1	21	36,000-1,300	2	21
Toluene	-	0	21	2,000,000-7	6	21
Trichloroethene	-	0	21	9	1	21
Acetone	5,000-58	13	21	2,000-68	15	21
2-Butanone	1,400-130	2	21	9,200-51	6	21
Carbon disulfide	-	0	21	7	1	21
2-Hexanone	-	0	21	36,000	1	21
Total xylenes	-	0	21	310,000	1	21

TABLE 5.5.2.1-7

SUMMARY OF DETECTED HERBICIDES, PESTICIDES, AND PCB's
NEAR-SURFACE SOILS
(Expressed as µg/kg or ppb)

	0-6 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
4,4'-DDT	3,500,000-620	19	21	5,090,000-1,400	15	21
4,4'-DDE	93,000-20	14	21	37,000-1,200	8	21
4,4'-DDD	13,000-1,700	3	21	164,000-1,200	5	21
Alpha-Endosulfan	8,900	1	21	1,400	1	21
Dalapon	70,000-190	9	21	29,000-420	9	21
2,4-D	7,600-740	10	21	85,000-190	13	21
2,4,5-T	2,300-190	9	21	86,000-490	10	21

TABLE 5.5.2.1-8

SUMMARY OF DETECTED INORGANIC PARAMETERS
NEAR-SURFACE SOILS
(Expressed as µg/kg or ppb)

	0-6 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Antimony	6.6-0.09	14	21	3.0-0.10	17	21
Arsenic	23-0.13	21	21	4-0.60	21	21
Beryllium	0.85-0.22	11	21	0.84-0.25	9	21
Cadmium	3.9-0.09	12	21	26-0.08	14	21
Chromium	50-1.1	21	21	50-5.9	21	21
Copper	260-2.4	21	21	250-2.0	20	21
Lead	887-1.8	21	21	646-2.1	20	21
Mercury	39-0.1	18	21	37-0.4	16	21
Nickel	82-3.1	20	21	40-2.1	20	21
Selenium	48	1	21	2.2-0.01	3	21
Silver	1.2-0.24	7	21	11-0.25	6	21
Zinc	29,000-20	21	21	1,300-8.0	21	21
Total Cyanide	1.97-0.15	19	21	2.8-0.10	19	21
Total Phenols	47.8-0.28	20	21	3,378-0.10	21	21

TABLE 5.5.2.2-1

SUMMARY OF BORING SOIL SAMPLES COLLECTED FOR CHEMICAL ANALYSES

DEPTH (inches)	ELEVATION CODE	NUMBER OF SAMPLES
0-6	100	8
6-12	102	8
12-24	103	8
-	109	8
-	201	7
TOTAL		39

TABLE 5.5.2.2-2

BORING SOIL SAMPLE 2,3,7,8-TCDD REANALYSIS SUMMARY

STATION NUMBER	DEPTH (inches)	ELEVATION CODE	INITIAL RESULTS (ppb)	CORRECTIVE ACTION	REANALYSYS RESULTS (ppb)
C-7-C	6-12	101	477	1 gram	784
F-7-B	0-6	100	>1,450	1 gram	2,560
F-7-B	12-24	102	600	1 gram	687
I-2-L	0-6	100	>1,340	1 gram	2,700
I-5-A	0-6	100	>260	1 gram	523
I-5-A	6-12	101	>530	1 gram	883
I-5-A	12-24	102	>450	1 gram	830
I-7-K	0-6	100	350	1 gram	350
I-7-K	6-12	101	>1,500	1 gram, 3:1 dilution	3,510

TABLE 5.5.2.2-3

BORING SOIL SAMPLES
2,3,7,8-TCDD RESULTS
(µg/kg or ppb)

SAMPLE ELEVATION CODE	DEPTH (inches)	STATION NUMBERS							
		A-2-K	A-3-C	C-7-C	D-1-F	F-7-B	I-2-L	I-5-A	I-7-K
100	0-6	56.3	19.7	130	61.6	2,560	2,700	523	350
101	6-12	36.0	18.8	784	7.5	109	218	883	3,510
102	12-24	72.5	7.4	247	4.7	687	93.6	830	59.3
109	above silt	0.36 (6.5-8.5')	ND (0.02) (6.5-8.0')	71.8 (6.5-8.0')	0.78 (6.5-8.7')	2.4 (6.5-8')	12.1 (13.5-15.5')	20.9 (13.5-15.2')	5.8 (7-8.5')
201	silt	ND (0.07) (12.7-14.7')	ND (0.3) (11.0-13.0')	2.1 (10.0-12.0')	ND (0.06) (10.7-12.7')	0.49 (10.0-12.0')	2.2 (17.0-19.0')	no sample	2.8 (13.5-15.2')

TABLE 5.5.2.2-4

BORING SOILS SAMPLES
ORGANIC PRIORITY POLLUTANT ANALYSIS LEVELS

STATION	BOREHOLE	DEPTH	VOA	BASE/NEUTRAL/ACID	PESTICIDE	HERBICIDE
I-2-L	1	0-6"	Low	Low	Low(1)	Low(2)
I-2-L	1	12-24"	Low	Low	Low(3)	Low(2)
I-2-L	1	13.5-15.5'	Low(4)	Low(5)	Low(3)	Low(2)
I-5-A	2	0-6"	Low	Low	Low(8)	Low(2)
I-5-A	2	12-24"	Low	Low(5)	Low(11)	Low(2)
I-5-A	2	13.5-15.2'	Medium(5)	Medium(5)	Medium(4)	Low(3)
I-7-K	3	0-6"	Low	Low(2)	Low(10)	Low(6)
I-7-K	3	12-24"	Low	Low	Low(7)	Low(6)
I-7-K	3	7-8.5'	Low	Low	Low(5)	Low(2)
C-7-C	4	0-6"	Low	Low(5)	Medium	Low
C-7-C	4	12-24"	Low	Low	Medium(6)	Low
C-7-C	4	6.5-8'	Low(7)	Low(6)	Medium(6)	Low(7)
A-2-K	5	0-6"	Low	Medium	Medium(1)	Low
A-2-K	5	12-24"	Low	Medium	Medium(9)	Low
A-2-K	5	6.5-8.5'	Low	Medium	Low(6)	Low
A-3-C	6	0-6"	Low	Medium	Medium(6)	Low
A-3-C	6	12-24"	Low	Medium	Medium(8)	Low
A-3-C	6	6.5-8.5'	Low	Medium	Medium	Low
D-1-F	7	0-6"	Low	Low	Medium	Low
D-1-F	7	12-24"	Low	Medium	Medium	Low
D-1-F	7	6.5-8.7'	Low	Low	Medium	Low
F-7-B	8	0-6"	Low	Low	Low(10)	Low(2)
F-7-B	8	12-24"	Low(9)	Low(5)	Low(10)	Low(2)
F-7-B	8	6.5-8'	Low	Low	Low(5)	Low(2)

(1) Further dilution 1:500

(2) Further dilution 1:5

(3) Further dilution 1:1000

(4) Further dilution 1:200

(5) Further dilution 1:2

(6) Further dilution 1:10

(7) Further dilution 1:50

(8) Further dilution 1:2000

(9) Further dilution 1:20

(10) Further dilution 1:100

(11) Further dilution 1:10,000

TABLE 5.5.2.2-5

SUMMARY OF DETECTED BASE/NEUTRAL/ACID ORGANICS
IN SOIL BORINGS
(Expressed as µg/kg or ppb)

	0-6 INCHES			12-24 INCHES			ABOVE SILT		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
2,4,6-Trichlorophenol	32,000-1,300	3	8	4,400-3,600	2	8	360,000-2,000	3	8
2,-Chlorophenol	2,000-230	2	8	820	1	8	6,000-1,200	2	8
2,4-Dichlorophenol	98,000-5,900	3	8	27,000-4,700	3	8	1,400,000-1,700	5	8
Phenol	3,100	1	8	12,000-1,400	2	8	13,000-820	2	8
2,4,5-Trichlorophenol	20,000-1,500	4	8	16,000-1,600	3	8	270,000-12,000	4	8
Acenaphthene	2,200	1	8	4,600	1	8	0	0	8
1,2,4-Trichlorobenzene	1,100-430	2	8	8,500-580	2	8	14,000	1	8
Hexachlorobenzene	35,000-6,500	5	8	84,000-4,900	4	8	30,000	1	8
2-Chloronaphthalene	1,100	1	8	850	1	8	-	-	8
1,2-Dichlorobenzene	770	1	8	8,600-570	2	8	13,000	1	8
1,3-Dichlorobenzene	-	0	8	780	1	8	3,400	1	8
1,4-Dichlorobenzene	2,700	1	8	49,000-960	3	8	28,000-4,600	3	8
Fluoranthene	8,700-400	5	8	20,000-3,200	4	8	1,300-560	3	8
Naphthalene	1,300	1	8	11,000	1	8	16,000-260	5	8
Bis(2-ethylhexyl)phthalate	14,000	1	8	5,100-2,600	2	8	-	0	8

TABLE 5.5.2.2-5
(Continued)

	0-6 INCHES			12-24 INCHES			ABOVE SILT		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzo(a)anthracene	-	0	8	1,900	1	8	-	0	8
Benzo(a)pyrene	-	0	8	1,600	1	8	-	0	8
Benzo(b)fluoranthene	-	0	8	7,400	1	8	1,900	1	8
Chrysene	-	0	8	4,200	1	8	-	0	8
Anthracene	950	1	8	1,200	1	8	-	0	8
Fluorene	2,100	1	8	4,200	1	8	-	0	8
Phenanthrene	3,800-230	3	8	14,000-720	5	8	2,200-350	2	8
Indeno(1,2,3,-CD)-pyrene	-	0	8	1,400	1	8	-	0	8
Pyrene	8,100-270	5	8	18,000-1,300	5	8	460-420	2	8
Benzyl Alcohol	-	0	8	20,000	1	8	41,000	1	8
Dibenzofuran	1,300	1	8	2,100	1	8	-	0	8
2-Methylnaphthalene	2,600	1	8	8,000-850	3	8	14,000-1,600	4	8

TABLE 5.5.2.2-6

SUMMARY OF DETECTED VOLATILE ORGANICS
IN SOIL BORINGS
(Expressed as μg/kg or ppb)

	0-6 INCHES			12-24 INCHES			ABOVE SILT		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzene	26	1	8	1,700-680	2	8	22,000-5,600	2	8
Chlorobenzene	330	1	8	24,000-49	4	8	100,000-17	5	8
Ethylbenzene	-	0	8	100	1	8	14,000-220	2	8
Methylene chloride	410-38	8	8	1,600-6	8	8	11,000-48	8	8
Tetrachloroethane	-	0	8	15	1	8	-	0	8
Toluene	12-7	2	8	2,400-9	4	8	180,000-11	2	8
Acetone	160-57	5	8	2,300-110	7	8	4,500-85	6	8
2-Butanone	-	0	8	8,900	1	8	20,000-6,900	2	8
Carbon disulfide	-	0	8	7	1	8	13	1	8
Total xylenes	-	0	8	580	1	8	1,200	1	8

TABLE 5.5.2.2-7

SUMMARY OF DETECTED HERBICIDES, PESTICIDES, AND PCB's IN SOIL BORINGS

(Expressed as µg/kg or ppb)

	0-6 INCHES			12-24 INCHES			ABOVE SILT		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
4,4'-DDT	830,000-17,000	5	8	3,200,000-43,000	5	8	140,000-100	4	8
4,4'-DDE	57,900-6,500	6	8	297,000-2,400	6	8	1,500-290	4	8
4,4'-DDD	78,000-2,000	5	8	182,000-3,900	5	8	370,000-42	5	8
Beta-BHC	130,000-830	2	8	120,000	1	8	100,000	1	8
Dalapon	21,000-160	6	8	94,000-300	5	8	-	0	8
Dicamba	1,700-230	3	8	1,600-100	3	8	160	1	8
2,4-D	120,000-240	8	8	16,000-110	8	8	2,800,000-140	7	8
2,4,5-T	54,000-94	8	8	14,000-95	7	8	690,000-610	5	8
2,4-DB	-	0	8	1,400	1	8	170	1	8
Dinoseb (DNBP)	590-210	2	8	-	0	8	-	0	8

TABLE 5.5.2.2-8

SUMMARY OF DETECTED INORGANIC PARAMETERS IN SOIL BORINGS

(Expressed as µg/kg or ppb)

	0-6 INCHES			12-24 INCHES			ABOVE SILT		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Antimony	11-0.2	8	8	3.5-0.1	8	8	1.1-0.1	6	8
Arsenic	20-1.0	8	8	26-2.1	8	8	120-5.7	8	8
Beryllium	-	0	8	3.7-0.2	5	8	1.4-0.1	5	8
Cadmium	3-0.5	8	8	2.5-0.3	8	8	3-0.1	6	8
Chromium	72-7.9	8	8	40-13	8	8	25-5.5	8	8
Copper	290-46	8	8	730-82	8	8	6,600-24	8	8
Lead	1,400-73	8	8	2,300-180	8	8	11,000-19	8	8
Mercury	11-0.1	8	8	7.6-0.5	8	8	95-0.2	7	8
Nickel	95-15	8	8	170-13	8	8	72-5.8	8	8
Silver	0.92-0.2	6	8	0.9-0.3	4	8	1.8-0.4	5	8
Zinc	3,900-180	8	8	1,500-190	8	8	1,300-45	8	8
Total Cyanides	1.2-0.25	8	8	3.7-0.15	8	8	1.2-0.1	8	8
Total Phenols	13-0.2	8	8	12-0.2	8	8	1,600-0.3	7	8

TABLE 5.5.2.3-1

ADDITIONAL SELECTED SILT ZONE SAMPLES FOR 2,3,7,8-TCDD ANALYSIS

(µg/kg or ppb)

SAMPLE LOCATION	BOREHOLE NUMBER	ELEVATION CODE 200(2)	 201(1)	 202(2)	 203(2)
C-7-C	4		2.1 (10.0-12.0')	1.2 (12.0-14.0')	
Initial F-5-E(3)	11		1.8 (silt)		
Archive F-5-E			ND (0.24) (10.5-12.5')		ND (0.18) (141.5-16.5')
G-5-E(4)	10		11.8 (silt)		
I-2-L	1	ND (0.27) (15.0-17.0')	2.2 (17.0-19.0')		
I-7-K	3	2.1 (8.5-10.5')	2.8 (8.5-10.5')		

(1) Results of initial 201 samples; collected using top and bottom compositing technique.

(2) Results of samples taken from the centers of archived Shelby tubes.

(3) Results not reported elsewhere. Initial 201 sample taken by top and bottom compositing. Archive sample is from the archived Shelby tube center that initial sample was taken from.

(4) Results not reported elsewhere.

TABLE 5.6.1-1

SUMMARY OF MONITORING WELL DATA

WELL NUMBER	DEPTH TO STATIC WATER LEVEL(1) (ft)	GROUND SURFACE ELEVATION(2) (ft)	DEPTH TO TOP OF SCREEN(3) (ft)	DEPTH TO BOTTOM OF SCREEN(3) (ft)	ESTIMATED SATURATED THICKNESS OPPOSITE WELL SCREEN (ft)	DEPTH INTERVAL (ft)
MW-1	6.6	98.7	3.5	14.2	7.9	6.6 to 14.5
MW-2	4.6	98.9	3.5	15.2	5.0	6.5 to 11.5
MW-3	4.7	97.3	3.0	8.5	3.8	4.7 to 8.5
MW-4	0.7	97.6	2.0	7.0	6.0	0.7 to 6.7
MW-5	4.2	98.9	3.0	8.5	3.8	4.2 to 8.0
MW-6	4.1	98.9	1.9	7.9	3.7	4.1 to 7.8
MW-7	1.6	98.4	2.0	8.2	1.9	1.6 to 3.5
MW-8	0.4	99.7	2.0	7.0	4.6	0.4 to 5.0

(1) Depths to static water level from ground surface at the time of slug tests (obtained from field log notebook.

(2) Elevations are with respect to site datum.

(3) Depths are with respect to ground surface.

TABLE 5.6.1-2

RESULTS OF SLUG-TEST ANALYSIS

		HYDRAULIC CONDUCTIVITY OF PERMEABLE ZONE (ft/day)		
WELL NUMBER	FALLING HEAD OR RISING HEAD	METHOD OF COOPER BREDEHOEFT & PAPADOPULOS	METHOD OF BOUWER AND RICE	
			Using Diam. Of Casing & Screen	Using Diam. of Drilled Hole
MW-1A	FH	8.3	9.1	74.3
	RH	17.6	7.5	60.9
MW-2A	RH	280	87.3	763
	RH	316	97.6	852
MW-3A	FH	42.6	56.0	404
	RH	14.6	21.2	152
MW-4A	FH	1.2	4.5	2.3
	RH	2.0	3.4	1.8
MW-5A	FH	11.6	20.4	152
	RH	48.5	22.8	168
MW-6A	RH	15.4	34.6	247
MW-7A	FH	85.3	12.9	6.7
	RH	62.2	15.8	126
MW-8A	FH	7.0	11.7	6.0
	RH	4.3	9.2	4.7

TABLE 5.6.2-1

REPRESENTATIVE HYDRAULIC CONDUCTIVITY VALUES(1)

WELL NUMBER	MEAN HYDRAULIC CONDUCTIVITY (ft/day)	RANGE IN HYDRAULIC CONDUCTIVITY (ft/day)	DEPTH RANGE OF MOST PERMEABLE ZONE (ft)
MW-1	10	5-15	6.6 to 14.5
MW-2	200	100-300	6.5 to 11.5
MW-3	40	20-60	4.7 to 8.5
MW-4	3	2-4	0.7 to 6.7
MW-5	20	10-30	4.2 to 8.0
MW-6	30	20-40	4.1 to 7.8
MW-7	10	5-15	1.6 to 3.5
MW-8	10	5-15	0.4 to 5.0

(1) Hydraulic conductivities are estimated values assigned to the zone in which the monitoring wells are screened. Results were determined from field slug tests.

TABLE 5.6.4-1

GROUND WATER 2,3,7,8-TCDD REANALYSIS SUMMARY

SAMPLING DATE	INITIAL RESULT (ppb)	FINAL RESULT (ppb)
10-09-84	7.4	7.9
10-30-84	4.8(1)	4.3
12-14-84	7.4	10.4

(1) A 100-ml sample from the original sampled water (no extract) after it had been allowed to settle gave a 1.5 ppb result.

NOTE: All samples are from Well No. 2 and 5:1 dilution of the extract was required.

TABLE 5.6.4-2

SUMMARY OF 2,3,7,8-TDDD FOR GROUND WATER

WELL NUMBER	LOCATION	SAMPLING DATE	RESULTS (ppb)	SAMPLING DATE	RESULTS (ppb)	SAMPLING DATE	RESULTS (ppb)
1	I-2-L	10-09-84	0.68	10-30-84	0.56		
2	I-5-A	10-09-84	7.9	10-30-84	4.3	12-14-84	10.4
3	I-7-K	10-10-84	0.049	10-30-84	0.03		
4	C-7-C	10-09-84	0.20	10-30-84	0.74		
5	A-2-K	10-09-84	ND(0.008)	10-30-84	0.0059		
6	A-3-C	10-09-84	0.012	10-30-84	0.0086		
7	D-1-F	10-09-84	0.016	10-30-84	ND(0.024)		
8	F-7-B	10-09-84	0.72	10-30-84	1.1		

ND - not detected at the indicated ( ) detection limit.

TABLE 5.6.4-3

SUMMARY OF DETECTED BASE/NEUTRAL/ACID ORGANICS
WELL WATER SAMPLES
(Expressed as µg/l or ppb)

	10-09-84			10-30-84		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
2,4,6-Trichlorophenol	1,700-11,000	3	8	290-3,900	3	8
2-Chlorophenol	290-4,600	3	8	11-3,600	4	8
2,4-Dichlorophenol	160-48,000	5	8	370-58,000	4	8
Phenol	36-3,700	5	8	43-600	3	8
Benzoic Acid	250	1	8	ND	0	8
2-Methylphenol	ND	0	8	24	1	8
4-Methylphenol	39-66	2	8	ND	0	8
2,4,5-Trichlorophenol	56-8,800	5	8	38-26,000	4	8
Acenaphthene	ND	0	8	30	1	8
1,2,4-Trichlorobenzene	200	1	8	9-890	3	8
Hexachlorobenzene	ND	0	8	770-860	2	8
2-Chloronaphthalene	ND	0	8	5	1	8
1,2-Dichlorobenzene	11-390	3	8	3-980	4	8
1,3-Dichlorobenzene	ND	0	8	13-200	2	8
1,4-Dichlorobenzene	110-590	3	8	6-1,200	4	8
Fluoranthene	15	1	8	3-120	5	8
Naphthalene	10-320	4	8	11-480	3	8
Bis(2-ethylhexyl)phthalate	55	1	8	3-75	3	8
Di-N-butylphthalate	12	1	8	8	1	8
Benzo(a)anthracene	ND	0	8	8	1	8
Anthracene	ND	0	8	4	1	8
Fluorene	10	1	8	32	1	8
Phenanthrene	2-34	2	8	3-110	5	8
Pyrene	3-19	3	8	5-46	5	8
Benzyl alcohol	8,000	1	8	4,300	1	8
2-Methylnaphthalene	7-260	4	8	3-900	6	8

TABLE 5.6.4-4

SUMMARY OF DETECTED VOLATILE ORGANICS
WELL WATER SAMPLES
(Expressed as μg/l or ppb)

	10-09-84			10-30-84		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzene	3.0-3,900	8	8	10-7,900	7	8
Chlorobenzene	14-8,500	6	8	4-23,000	7	8
1,2-Dichloroethane	1,700	1	8	2,000	1	8
1,1,1-Trichloroethane	410	1	8	1,500	1	8
1,1-Dichloroethane	5	1	8	190	1	8
Chloroform	20-230	2	8	19-240	3	8
1,1-Dichloroethane	ND	0	8	53	1	8
trans-1,2-Dichloroethene	33-360	2	8	30-1,300	2	8
Ethylbenzene	44-740	3	8	43	2	8
Methylene chloride	6-12,000	8	8	3-7,400	8	8
Tetrachloroethene	2-5	2	8	2-43	3	8
Toluene	7-1,100	6	8	55-3,300	5	8
Trichloroethene	15-230	2	8	9-280	2	8
Vinyl chloride	28-88	2	8	24-220	2	8
Acetone	29-540	3	8	21-520	3	8
2-Butanone	870	1	8	180-430	2	8
Carbon disulfide	2-65	2	8	ND	0	8
4-Methyl-2-pentanone	3,300	1	8	1,800	1	8
Total xylenes	42-960	4	8	13-570	4	8

TABLE 5.6.4-5

SUMMARY OF DETECTED HERBICIDES, PESTICIDES, AND PCB's
WELL WATER SAMPLES
(Expressed as µg/l or ppb)

	10-09-84			10-30-84		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
4,4'-DDT	17-22,000	4	8	14-2,770	4	8
4,4'-DDE	17-54	2	8	7-14	2	8
4,4'-DDD	15-13,000	5	8	7-1,390	4	8
Alpha-endosulfan	ND	0	8	1,240	1	8
2,4-D	6.9-27,000	6	8	74-20,000	4	8
2,4,5-T	470-5,600	4	8	68-3,500	4	8
2,4-DB	500	1	8	ND	0	8
Dinoseb (DNBP)	4.2	1	8	ND	0	8

TABLE 5.6.4-6

SUMMARY OF DETECTED INORGANIC PARAMETERS
WELL WATER SAMPLES
(Expressed as µg/l or ppb)

	10-09-84			10-30-84		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Antimony	0.003-0.151	7	8	0.001-0.024	8	8
Arsenic	0.015-0.621	8	8	0.028-0.629	8	8
Beryllium	0.003-0.008	5	8	0.002-0.010	7	8
Cadmium	0.002-0.029	8	8	0.002-0.023	8	8
Chromium	0.02-0.73	8	8	0.08-1.1	8	8
Copper	0.091-1.3	8	8	0.206-2.9	8	8
Lead	0.18-47	8	8	0.44-14	8	8
Mercury	0.001-0.16	8	8	0.002-0.066	8	8
Nickel	0.06-0.30	8	8	0.06-0.42	8	8
Selenium	ND	0	8	0.007	1	8
Silver	0.003-0.007	4	8	0.002-0.015	5	8
Zinc	0.247-17	8	8	0.864-17	8	8
Total Cyanide	0.01-0.35	7	8	0.01-0.63	7	8
Total Phenol	0.03-102	8	8	0.03-78	8	8

TABLE 5.7.2-1

SUMMARY OF DETECTED COMPOUNDS IN PASSAIC RIVER WATER SAMPLES (Expressed as µg/l or ppb)

	10/09/84			10/30/84		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
VOLATILE ORGANICS						
Chlorobenzene	ND	0	1	7	1	1
Chloroform	1	1	1	ND	0	1
trans-1,2-dichlorethane	2	1	1	2	1	1
Methylene chloride	4	1	1	7	1	1
Tetrachloroethene	3	1	1	3	1	1
Trichloroethene	2	1	1	1	1	1
Carbon disulfide	4	1	1	ND	0	1
BASE/NEUTRAL/ACID ORGANICS						
1,2-Dichlorobenzene	11	1	1	ND	0	1
Bis(2-ethylhexyl)phthalate	ND	0	1	2	1	1
Di-N-butylphthalate	6	1	1	ND	0	1
HERBICIDES, PESTICIDES, AND PCB's						
4,4'-DDT	3.5	1	1	ND	0	1
4,4'-DD	1.2	1	1	ND	0	1
INORGANIC PARAMETERS						
Arsenic	0.008	1	1	0.002	1	1
Chromium	ND	0	1	0.02	1	1
Copper	0.018	1	1	0.038	1	1
Nickel	0.10	1	1	ND	0	1
Zinc	0.011	1	1	0.049	1	1
Total Cyanide	0.02	1	1	0.01	1	1
Total Phenol	0.03	1	1	0.05	1	1

TABLE 5.8-1

DESIGNATED ANALYSES FOR PASSAIC RIVER SEDIMENTS

STATION NUMBER	DEPTH 0-12 (inches)	 12-24 (inches)
0-1-0	PP/D	NC
0-2-0	D	D
0-3-0	PP/D	NC
0-4-0	D	D
0-5-0	PP/D	PP/D
0-6-0	D	D
0-6-1	D	D
0-6-2	D	D
0-7-0	D	NC
0-8-0	PP/D	PP/D
0-8-1	PP/D	PP/D
0-8-2	PP/D	PP/D
0-9-0	PP/D	NC
1-0-0	PP/D	NC
1-1-0	D	D
1-1-1	D	D
1-1-2	D	D
1-2-0	D	D
1-3-0	PP/D	PP/D
1-4-0	D	NC
1-5-0	PP/D	NC
1-6-0	D	NC
1-7-0	D	NC

PP - priority pollutant defined by EPA contract laboratory program as acid/base/neutral, pesticide and PCB, and volatile organic compounds; herbicides, metals, total cyanides, total phenols.

D - Dioxin (2,3,7-8-TCDD).

NC - no sample designated to be collected.

TABLE 5.8-2

PASSAIC RIVER SEDIMENT SAMPLE
2,3,7,8-TCDD ANALYSIS RESULTS

DIOXIN RESULTS (ppb)

UPSTREAM STATIONS

SAMPLE DEPTH (inches)	ELEVATION CODE	0-1-0	0-2-0	0-3-0	0-4-0	0-5-0	0-6-0	0-7-0	0-8-0
0-12	300	3.9	0.96	1.1	0.53	ND(0.54)	ND(0.72)	1.8	0.6
12-24	299	-	ND(0.23)	-	1.8	ND(0.20)	3.2	-	10.4

DOWNSTREAM STATIONS

		0-9-0	1-0-0	1-1-0	1-2-0	1-3-0	1-4-0	1-5-0	1-6-0	1-7-0
0-12	300	10.8	2.3	0.87	1.7	1.3	0.97	0.94	2.0	1.1
12-24	299	-	-	65.6	-	130	-	-	-	-

CENTER STATIONS

		0-6-1	0-8-1	1-1-1
0-12	300	ND(0.69)	ND(0.32)	ND(0.27)
12-24	299	0.63	1.3	1.5

NORTH BANK STATIONS

		0-6-2	0-8-2	1-1-2
0-12	300	1.2	ND(0.22)	3.5
12-24	299	ND(0.16)	ND(0.54)	10.3

ND = not detected at the indicated ( ) detection limit.

TABLE 5.8-3

RESAMPLING 2,3,7,8-TCDD RESULTS OF PASSAIC RIVER SEDIMENT STATION 1-3-0

SAMPLE IDENTIFICATION NUMBER	ELEVATION CODE	SAMPLE DEPTH	2,3,7,8-TCDD RESULTS (ppb)
1-3-0-1785-300	300	0-3'4"	151
1-3-0-1786-299	299	3'4"-3'10"	151
1-3-0-1787-298	298	3'10"-4'4"	176
1-3-0-1788-297	297	5'-5'6"	238
1-3-0-1789-296	296	5'6"-6'0"	450(1)

(1) Reanalysis result from 1 gram sample aliquot; original (10 g) result of 324 ppb was outside the linear calibration range.

TABLE 5.8-4

PASSAIC RIVER SEDIMENT SAMPLES
ORGANIC PRIORITY POLLUTANT ANALYSIS LEVELS

STATION NUMBER	DEPTH (inches)	VOA	BASE/NEUTRAL/ACID	PESTICIDE	HERBICIDE
0-1-0	0-12	Low	Low	Low	Low
0-3-0	0-12	Low	Low	Low	Low
0-5-0	0-12	Low	Medium/Low(1)	Low	Low
0-5-0	12-24	Low	Medium/Low(1)	Low	Low
0-8-0	0-12	Low	Medium/Low(1)	Low	Low
0-8-0	12-24	Low	Low	Low	Low(2)
0-8-1	0-12	Low	Low	Low	Low
0-8-1	12-24	Low	Low	Low	Low
0-8-2	0-12	Low	Medium	Low	Low
0-8-2	12-24	Low	Low	Low	Low(2)
0-9-0	0-12	Low	Low	Low	Low
1-0-0	0-12	Low	Low(3)	Low	Low
1-3-0	0-12	Low	Low	Medium	Low
1-3-0	12-24	Low	Medium	Medium	Low(4)
1-5-0	0-12	Low	Low	Low	Low(2)

(1) These samples contained only one B/N/A compound at a concentration greater than the medium level detection limit; they were re-extracted and analyzed as low-level samples.

(2) Further diluted 1:5 - See Organics Analysis Data Sheet.

(3) Further diluted 1:2 - See Organics Analysis Data Sheet.

(4) Further diluted 1:200 - See Organics Analysis Data Sheet.

TABLE 5.8-5

SUMMARY OF DETECTED BASE/NEUTRAL/ACID ORGANIC COMPOUNDS
PASSAIC RIVER SEDIMENTS
(Expressed as µg/kg or ppb)

	0-12 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
2,4-Dichlorophenol	-	0	10	360,000	1	5
2,4,5-Trichlorophenol	-	0	10	140,000	1	5
Acenaphthene	24,000	1	10	1,200	1	5
Fluoranthene	78,000-300	8	10	1,800-610	4	5
Naphthalene	-	0	10	710	1	5
Bis(2-ethylhexyl)phthalate	66,000-12,000	9	10	37,000-11,000	4	5
Di-N-octylphthalate	640-230	2	10	860-590	2	5
Benzo(a)anthracene	42,000-810	2	10	590	1	5
Benzo(a)pyrene	30,000	1	10	880	1	5
Benzo(b)fluoranthene	29,000	1	10	780	1	5
Chrysene	95,000	1	10	3,400-1,200	2	5
Acenaphthylene	8,300-440	2	10	360	1	5
Anthracene	58,000	1	10	1,700-330	2	5
Fluorene	18,000	1	10	1,500	1	5
Phenanthrene	110,000-440	4	10	3,900-430	3	5
Pyrene	100,000-260	6	10	3,600-520	4	5
2-Methylnaphthalene	250	1	10	1,600	1	5

TABLE 5.8-6

SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS
PASSAIC RIVER SEDIMENTS
(Expressed as μg/kg or ppb)

	0-12 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzene	28-7	6	10	210	1	5
Chlorobenzene	250-53	4	10	96	1	5
Methylene chloride	640-73	10	10	680-65	5	5
Chloromethane	-	0	10	140	1	5
Tetrachloroethane	-	0	10	22	1	5
Toluene	32	1	10	270-52	2	5
Acetone	1,600-220	8	10	830-190	5	5
2-Butanone	160-70	4	10	310-69	4	5
Carbon disulfide	31-9	3	10	25-12	2	5
Total xylenes	400-140	2	10	500	1	5

TABLE 5.8-7

SUMMARY OF DETECTED HERBICIDE, PESTICIDES AND PCBs
PASSAIC RIVER SEDIMENTS
(Expressed as µg/kg or ppb)

	0-12 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Dieldrin	-	0	10	12,000	1	5
4-4'-DDT	4,400-430	4	10	1,300	1	5
4,4'-DDE	93-23	5	10	75-24	3	5
4,4'-DDD	58-22	6	10	350-44	2	5
PCB-1242	720-120	8	10	8,100-460	3	5
PCB-1254	300-200	2	10	200	1	5
Dalapon	180-120	2	10	-	0	5
Dichloroprop (2,4-DP)	470	1	10	-	0	5
2,4-D	900-130	5	10	490,000	1	5
2,4,5-T	100-81	3	10	820,000-76	2	5
Dinoseb (DNBP)	300-180	6	10	-	0	5

TABLE 5.8-8

SUMMARY OF DETECTED INORGANIC PARAMETERS
PASSAIC RIVER SEDIMENTS
(Expressed as μg/kg or ppb)

	0-12 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Antimony	3.3-0.3	10	10	3.4-0.2	5	5
Arsenic	79-7.5	10	10	97-8.3	5	5
Beryllium	1.1-0.39	10	10	0.85-0.54	5	5
Cadmium	21.0-4.8	10	10	16-3	5	5
Chromium	970-200	10	10	550-260	5	5
Copper	700-220	10	10	720-320	5	5
Lead	760-410	10	10	700-460	5	5
Mercury	18.0-4.9	10	10	13-3	5	5
Nickel	116-51	10	10	114-55	5	5
Silver	11.0-4.0	10	10	9.4-4.2	5	5
Zinc	2,100-700	10	10	1,500-850	5	5
Total Cyanide	4.5-<0.5	10	10	6.8-1.02	5	5
Total Phenols	1.5-0.02	8	10	298-0.4	5	5

TABLE 5.9.1-1

RESULTS OF 2,3,7,8-TCDD ANALYSIS
OF BORING SAMPLES FROM SHERWIN-WILLIAMS PROPERTY
BROWN STREET AND LISTER AVENUE
NEWARK, NEW JERSEY

ELEVATION CODE	DEPTH (inches)	RESULTS (ppb)
100	0-6	1.2
101	6-12	5.1
102	12-24	3.4
109	above silt (11-12.5')	ND(0.57)
201	silt (15-17')	ND(0.76)

ND - not detected at the indicated ( ) detection limit.

TABLE 5.9.2-1

RESULTS OF 2,3,7,8-TCDD ANALYSIS
NEWARK, NEW JERSEY BACKGROUND SAMPLES
(Expressed as μg/kg or ppb)

LOCATION	DEPTH (inches)	RESULTS
Harrison Avenue	0-6	ND(0.17)
Raymond Boulevard	0-6	ND(0.27)
Roanoke Avenue	0-6	ND(0.77)

ND - not detected at the indicated ( ) detection limit.

TABLE 5.9.2-2

SUMMARY OF DETECTED BASE/NEUTRAL/ACID ORGANIC COMPOUNDS
NEAR-SURFACE SOILS
FROM SITE AND NEWARK BACKGROUND SAMPLES
(Expressed as µg/kg or ppb)

	SITE - 0-6 INCHES			SITE - 12-24 INCHES			NEWARK BACKGROUND - 0-6 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
2,4,6-Trichlorophenol	1,500,000-1,300	5	21	1,700,000-8,700	4	21	-	0	3
2,4-Dichlorophenol	3,600,000-980	7	21	2,500,000-870	8	21	-	0	3
2,4-Dimethylphenol	-	0	21	1,700,000	1	21	-	0	3
Benzoic Acid	1,800	1	21	-	0	21	-	0	3
2,4,5-Trichlorophenol	15,000,000-870	5	21	7,500,000-2,500	5	21	-	0	3
Acenaphthene	250	1	21	-	0	21	-	0	3
1,2,4-Trichlorobenzene	17,000-1,500	2	21	19,000	1	21	-	0	3
Hexachlorobenzene	110,000-560	13	21	720,000-3,200	9	21	620,000-110,000	2	3
1,2-Dichlorobenzene	520-230	2	21	9,000	1	21	-	0	3
1,3-Dichlorobenzene	-	0	21	610	1	21	-	0	3
1,4-Dichlorobenzene	1,400-470	3	21	1,300	1	21	-	0	3
Fluoranthene	6,100-330	5	21	64,000-670	6	21	3,500-2,600	3	3
Naphthalene	200	1	21	8,200	1	21	480	1	3
Bis(2-ethylhexyl)phthalate	1,300-310	3	21	310,000-5,100	3	21	1,700-670	3	3

TABLE 5.9.2.-2

(Continued)

	80 LISTER - 0-6 INCHES			80 LISTER - 12-24 INCHES			NEWARK BACKGROUND - 0-6 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Di-N-butylphthalate	-	0	21	370,000-2,000	2	21	200	1	3
Benzo(a)anthracene	47,000-910	3	21	47,000-510	5	21	1,900-1,500	3	3
Benzo(a)pyrene	4,800-1,000	3	21	44,000-560	5	21	1,500-1,200	3	3
Benzo(b)fluoranthene	7,100-2,100	3	21	71,000-940	5	21	2,700-2,200	3	3
Chrysene	12,000-2,600	2	21	120,000-1,400	6	21	3,700-3,200	3	3
Acenaphthylene	690-210	2	21	860-240	2	21	610-250	3	3
Anthracene	3,000-310	4	21	1,200-630	3	21	600-580	2	3
Benzo(g,h,i)perylene	11,000-3,300	3	21	32,000	1	21	2,300-1,500	3	3
Fluorene	320	1	21	300-250	2	21	2,800-1,300	3	3
Phenanthrene	4,100-250	5	21	61,000-440	6	21	-	0	3
Indeno(1,2,3,-cd)-pyrene	2,500-2,200	2	21	21,000-480	2	21	1,700-1,100	3	3
Pyrene	2,200-230	6	21	78,000-280	7	21	1,700-1,400	3	3
Dibenzofuran	-	0	21	450	1	21	-	0	3
2-Methylnaphthalene	220	1	21	21,000	1	21	-	0	3

TABLE 5.9.2-3

SUMMARY OF DETECTED VOLATILE ORGANICS NEAR-SURFACE SOILS FROM SITE AND NEWARK BACKGROUND SAMPLES

(Expressed as µg/kg or ppb)

	SITE - 0-6 INCHES			SITE - 12-24 INCHES			NEWARK BACKGROUND - 0-6 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzene	21	1	21	23,000-11	3	21	-	0	3
Chlorobenzene	84,000-39	2	21	170,000-22	6	21	-	0	3
Chloroform	38	1	21	38,000-13	2	21	-	0	3
Ethylbenzene	-	0	21	60,000	1	21	-	0	3
Methylene chloride	1,500-14	21	21	130,000-21	21	21	66-32	3	3
Tetrachloroethane	860	1	21	36,000-1,300	2	21	-	0	3
Toluene	-	0	21	2,000,000-7	6	21	-	0	3
Trichloroethene	-	0	21	9	1	21	-	0	3
Acetone	5,000-58	13	21	2,000-68	15	21	-	0	3
2-Butanone	1,400-130	2	21	9,200-51	6	21	-	0	3
Carbon disulfide	-	0	21	7	1	21	-	0	3
2-Hexanone	-	0	21	36,000	1	21	-	0	3
Total xylenes	-	0	21	310,000	1	21	-	0	3

TABLE 5.9.2-4

SUMMARY OF DETECTED HERBICIDES, PESTICIDES AND PCBs
NEAR-SURFACE SOILS
FROM SITE AND NEWARK BACKGROUND SAMPLES

(Expressed as µg/kg or ppb)

	SITE - 0-6 INCHES			SITE - 12-24 INCHES			NEWARK BACKGROUND - 0-6 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
4,4'-DDT	3,500,000-620	19	21	5,090,000-1,400	15	21	200	1	3
4,4'-DDE	93,000-20	9	21	37,000-1,200	8	21	77-32	2	3
4,4'-DDD	13,000-1,700	3	21	164,000-1,200	5	21	-	0	3
Alpha-Endosulfan	8,900	1	21	1,400	1	21	-	0	3
PCB-1260	-	0	21	-	0	21	1,700-1,200	2	3
Dalapon	70,000-190	9	21	29,000-420	9	21	-	0	3
2,4-D	7,600-740	10	21	85,000-190	13	21	-	0	3
2,4,5-T	2,300-190	9	21	86,000-490	10	21	-	0	3

TABLE 5.9.2-5

SUMMARY OF DETECTED INORGANIC PARAMETERS
NEAR-SURFACE SOILS
FROM SITE AND NEWARK BACKGROUND SAMPLES

(Expressed as µg/kg or ppb)

	SITE - 0-6 INCHES			SITE - 12-24 INCHES			NEWARK BACKGROUND - 0-6 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Antimony	6.6-0.09	14	21	3.0-0.10	17	21	9.1-2.2	3	3
Arsenic	23-0.13	21	21	41-0.60	21	21	10-4.6	3	3
Beryllium	0.85-0.22	11	21	0.84-0.25	9	21	0.5-0.47	2	3
Cadmium	3.9-0.09	12	21	26-0.08	14	21	2.8-2.0	3	3
Chromium	50-1.1	21	21	50-3.9	21	21	98-51	3	3
Copper	260-2.4	21	21	250-2.0	20	21	311-127	3	3
Lead	887-1.8	21	21	646-2.1	20	21	1,700-595	3	3
Mercury	39-0.1	18	21	37-0.4	16	21	2.0-0.6	3	3
Nickel	82-3.1	20	21	40-2.1	20	21	74-35	3	3
Selenium	0.48	1	21	2.2-0.01	3	21	-	0	3
Silver	1.2-0.24	7	21	11-0.25	6	21	1.4-0.45	3	3
Zinc	29,000-20	21	21	1,300-8.0	21	21	828-428	3	3
Total Cyanide	1.97-0.15	19	21	2.8-0.10	19	21	2.9-0.78	3	3
Total Phenols	47.8-0.28	20	21	3,378-0.10	21	21	117	1	3

TABLE 5.10-1

2,3,7,8-TCDD ANALYSIS RESULTS
DRUM SAMPLING PROGRAM

DIOXIN CONCENTRATION (ppb)	SAMPLE ID	SAMPLE DESCRIPTION	NUMBER OF DRUMS REPRESENTED BY THIS SAMPLE
12.1	0018-0045-D-L	Drum No. 18, CY white and yellow crystals	15
12,220	0021-0064-D-L	Drum No. 21, CQ yellow crystall powders	11
8.0	0040-0091-D-L	Drum No. 40, 23AA milky liquid	5
54.0	0065-0136-D-L	Drum No. 65, 400, clear gold liquid	37
2.6	0075-0152-D-L	Drum No. 75, 15T pink thick liquid	9
13.9	0119-0255-D-L	Drum No. 119, CZ dark brown liquid	13
1.5	0162-0346-D-L	Drum No. 162, CX golden liquid	8
35.9	0176-0364-D-L	Drum No. 176, 21Y thick white paste	89
16.0	0183-0371-D-L	Drum No. 183, QQ pink and red liquid	14
7.5	0174-0403-D-L	Drum No. 174, 21Y thick white paste	89
3.4	0230-0502-D-L	Drum No. 230, BB clear liquid and white solids	31
476	0251-0523-D-L	Drum No. 251, ZB brown sludge and water	32
ND (1.7)	0305-0670-D-L	Drum No. 305, Pit clear liquid	11
ND (6.7)	0314-0679-D-L	Drum No. 314, 9K dark brown crystals	6
ND (3.8)	0388-0816-D-L	Drum No. 388, 18W clear liquid (rusty)	43
ND (2.0)	0392-0820-D-L	Drum No. 392, JJ golden liquid	38
12	0438-0925-D-L	Drum No. 438, NN white solids	13
ND (16.2)	0450-0937-D-L	Drum No. 450, DD white powder	12
174	0458-0948-D-L	Drum No. 458, S brown liquid	4
ND (8.4)	0492-1015-D-L	Drum No. 492, PP dark liquids w/solids	17
ND (2.0)	0554-1136-D-L	Drum No. 554, Pit 3 clear liquid	89
8,750	0558-1140-D-L	Drum No. 558, Pit 3 dark sludge w/water	89

ND = none detected; number in ( ) indicates the lower detection limit of the linear range due to background noise.

TABLE 5.11-1

RESULTS OF ANALYSES OF SELECTED SAMPLES 2,3,7,8-TCDD, 2,3,7,8-TCDF, AND OCDD

SAMPLE IDENTIFICATION	TYPE OF SAMPLE	2,3,7,8-(1) TCDD (ppb)	2,3,7,8-(2) TCDF (ppb)	OCDD(3)
H-2-H-1598-100	NSSS	93.5	1.9	81
A-3-C-0354-101	BSS	18.8	5.0	22.0
I-2-L-0857-109	BSS	12.1	12.6	82.0
B-2-M-1346-102	NSSS	2.8	ND(0.36)	ND(0.88)
A-5-G-1661-101	NSSS	453	ND(0.66)	4.8
F-5-E-1605-101	NSSS	394	10.6	10.0
G-5-E-1567-101	NSSS	217	217	37
H-7-H-1521-101	NSSS	27.6	25	3.3
H-5-F-1395-101	NSSS	69.3	ND(0.60)	8.7
A-2-G-1334-101	NSSS	330	2.3	38
C-7-C-0642-100	NSSS	180	8.2	49
A-2-K-0436-102	BSS	72.5	0.70	70
C-7-C-0710-109	BSS	71.8	1.0	2.2
I-7-K-1047-109	BSS	5.8	10.1	ND(0.62)
I-5-A-0869-109	BSS	20.9	ND(0.96)	27
C-7-C-0701-201	BSS	2.1	ND(0.49)	1.1
9600-1834-108	BSS-Sherwin-Williams	3.4	19.9	15.7
G-5-F-1448-100	NSSS	361	13.2	24
1-3-0-0309-299	River Sediment	130	14.9	16
1-1-0-0302-299	River Sediment	65.6	0.67	5.6
1-3-0-1785-300	River Sediment-Bed Sampling	151	11.4	10.6
0-9-0-0299-300	River Sediment	10.8	ND(0.43)	4.8
0-1-0-0186-300	River Sediment	3.9	ND(0.69)	8.5
0-8-0-0205-299	River Sediment	10.4	ND(0.23)	8.6

(1) 2,3,7,8-Tetrachlorodibenzo-p-dioxin.

(2) 2,3,7,8-Tetrachlorodibenzofuran.

(3) Octachlorodibenzo-p-dioxin.

TABLE 5.12-1

QUALITY ASSURANCE OBJECTIVES

ANALYSIS	MATRIX	METHOD PRECISION (% Rel. Std. Dev.)	METHOD ACCURACY (% Recovery)
2,3,7,8-TCDD	Water	±25	50-120
	Soil	±25	50-120
	Air/Ind.Hyg.	±25	50-120
	Surface Wipes	±25	50-120
	Misc. Organics	±25	50-120
Volatile Priority Pollutants	Water	±7-22(1)	75-120(1)
	Soil	±7-22(1)	60-130(1)
	Ambient Air	±7-22(1)	60-130(1)
	Misc. Organics	±7-22(1)	60-130(1)
Semi-volatile Priority Pollutants	Water	±6-70(1)	40-180(1)
	Soil	±6-70(1)	40-180(1)
	Ambient Air	±6-70(1)	40-180(1)
	Misc. Organics	±6-70(1)	40-180(1)
Priority Pollutant Metals	Water	±10(1)	70-100(1)
	Soil	±15(1)	70-100(1)
	Misc. Organics		
Cyanides	Water	±10	85
	Soil	±15	80
Total Phenols	Water	±1	75-100
	soil	±5	75-100

(1)The accuracy and precision are compound dependent.

NOTES: The Quality Assurance Objective for completeness is 90 percent for all of the above analyses.

The Method Precision and Method Accuracy reported for each analysis were generated by the EPA under ideal conditions. The precision and accuracy that can be achieved are frequently determined by the level of interferences present rather than instrumental or method limitations.

TABLE 5.12.1-1

FIELD BLANK COLLECTION SUMMARY

MATRIX	NUMBER SAMPLES COLLECTED	ANALYSIS PARAMETERS (SAMPLES)	NUMBER BLANKS COLLECTED	ANALYSIS PARAMETERS (BLANKS)	PERCENT FREQUENCY (BLANKS TO SAMPLES)
Solid	148	Full PP* (87)	35	VOA	24
		or	2	Dioxin	1.4
		Dioxin only (61)	2	Extractable PP	1.4
			2	PP Metals	1.4
			2	Cyanide	1.4
			2	Phenols	1.4
Water	19	Full PP*	2	Full PP*	10.5
Wipes	78	Dioxin only	15	Dioxin	15
Chips	70	Dioxin only	2	Dioxin	2.9

*PP indicates priority pollutants which includes dioxin.

TABLE 5.12.1-2

QUALITY CONTROL RESULTS
FIELD BLANKS FOR 2,3,7,8-TCDD ANALYSIS
(Concentration Units are in ppb)

SAMPLE TYPE/NUMBER	COLLECTION DATE	RESULT
Field Blank/L1556	10-15-84	ND(0.0007)
Field Blank/L1623	10-17-84	ND(0.009)

ND = not detected, detection limit reported in parentheses.

TABLE 5.12.1-3

QUALITY CONTROL RESULTS
FIELD AND TRIP BLANKS FOR PRIORITY POLLUTANT METALS ANALYSIS

(Concentration Units are mg/L - ppm)

PARAMETER	FIELD BLANK (K1374) 10-09-84*	TRIP BLANK (K1375) 10-09-84*	FIELD BLANK (K1703) 10-19-84*
Antimony	<0.001**	<0.001	<0.001
Arsenic	<0.001	<0.001	0.004
Beryllium	<0.001	<0.001	<0.002
Cadmium	<0.001	<0.001	<0.001
Chromium	<0.01	<0.01	<0.01
Copper	<0.002	<0.002	0.005
Lead	<0.01	<0.01	<0.01
Mercury	<0.001	0.001	<0.001
Nickel	<0.01	<0.01	<0.01
Selenium	<0.001	<0.001	<0.001
Silver	<0.002	<0.002	<0.002
Thallium	<0.02	<0.02	<0.02
Zinc	<0.001	<0.001	0.012

*Dates shown are collection dates.

**The less-than result indicates a value below the presented detection limit.

TABLE 5.12.1-4

QUALITY CONTROL RESULTS
FIELD AND TRIP BLANKS FORCYANIDE/PHENOLS ANALYSIS

(Concentration Units are in Mg/L - ppm)

SAMPLE TYPE/NUMBER	COLLECTION DATE	PARAMETER	RESULT
Field Blank/K1429	10-10-84	Cyanide	<0.01*
Trip Blank/K1430	10-10-84	Cyanide	<0.01
Field Blank/K1659	10-18-84	Cyanide	<0.01
Field Blank/K1513	10-11-84	Phenols	<0.01
Trip Blank/K1514	10-11-84	Phenols	<0.01
Field Blank/K1732	10-22-84	Phenols	0.08

*The less-than result indicates a value below the presented detection limit.

TABLE 5.12.1-5

SUMMARY OF VOLATILE CONTAMINANTS IN FIELD AND TRIP BLANKS

COMPOUND	FIELD BLANKS		TRIP BLANKS	
	NUMBER SAMPLES DETECTED	CONCENTRATION RANGE (ppb)	NUMBER SAMPLES DETECTED	CONCENTRATION RANGE (ppb)
Methylene chloride	37	(5-130)	37	(5-51)
1,1,1-Trichloroethane	1	4	0	-
Chloroform	19	(1-61)	6	(1-54)
Tetrachloroethene	1	4	0	-
Toluene	2	(1-2)	2	(1-1)
Trichloroethene	1	5	0	-
Acetone	5	(10-47)	7	(10-78)
Bromodichloromethane	14	(3-12)	4	(9-14)
Carbon disulfide	1	2	0	-

TABLE 5.12.2.1-1

QUALITY CONTROL ACCEPTANCE CRITERIA

SURROGATE RECOVERIES

SURROGATE COMPOUND	ACCEPTABLE PERCENT RECOVERY RANGE[*]	
	WATER	SOIL
VOA:		
1,2-Dichloroethane-d4	77-120	64-129
Toluene-d8	86-119	69-127
4-Bromofluorobenzene	85-121	61-122
B/N/A:		
Nitrobenzene-d5	41-120	24-115
2-Fluorobiphenyl	44-119	37-120
p-Terphenyl-d14	33-128	28-133
2-Fluorophenol	23-107	24-111
Phenol-d5	15-96	20-106
2,4,6-Tribromophenol	20-105	11-102
Pesticide:		
Dibutyl chlorendate	67-114	0-205

[*] In accordance with EPA contract laboratory program requirements.

TABLE 5.12.2.1-2

QUALITY CONTROL ACCEPTANCE CRITERIA SPIKE RECOVERIES AND RPD

SURROGATE COMPOUND	ACCEPTABLE PERCENT[*] RECOVERY RANGE WATER	ACCEPTABLE PERCENT[*] RECOVERY RANGE SOIL	ACCEPTABLE[*] RPD (%) WATER/SOIL
VOA:			
1,1-Dichloroethylene	61-145	59-177	<15
Trichloroethylene	71-120	62-137	<15
Benzene	76-127	66-142	<15
Toluene	76-125	59-139	<15
Chlorobenzene	75-130	60-133	<15
B/N/A:			
1,2,4-Trichlorobenzene	39-98	38-107	<50
Acenaphthene	46-118	31-137	<50
2,6-Dinitrotoluene	24-96	28-89	<50
Di-n-butylphthalate	11-117	29-135	<50
Pyrene	26-127	35-142	<50
N-Nitrosodi-n-propylamine	41-116	41-126	<50
1,4-Dichlorobenzene	36-97	28-104	<50
Pentachlorophenol	9-103	17-109	<40
4-Chloro-3-methylphenol	23-97	26-103	<40
Phenol	12-89	26-90	<40
2-Chlorophenol	27-123	25-102	<40
4-Nitrophenol	10-80	11-114	<40
Pesticide			
Lindane	56-123	46-127	<40
Heptachlor	40-131	35-130	<40
Aldrin	40-120	34-132	<40
Dieldrin	52-126	31-134	<40
Endrin	56-121	42-139	<40
p,p'-DDT	38-127	23-134	<40

---

[*] In accordance with EPA contract laboratory program requirements.

TABLE 5.12.2.1.1-1

QC SUMMARY DATA
ORGANIC PRIORITY POLLUTANT SURROGATE RECOVERY RESULTS
SOILS

ANALYSIS	AVERAGE PERCENT RECOVERY (±Std.Dev.)					
SURROGATE COMPOUND	LOW VOLATILE	MEDIUM VOLATILE	LOW BASE/NEUTRAL/ACID	MEDIUM BASE/NEUTRAL/ACID	LOW PESTICIDE	MEDIUM PESTICIDE
Toluene-d8	99 (±4.4)	94 (±7.3)	-	-	-	-
4-Bromofluorobenzene	95 (±6.4)	97 (±4.8)	-	-	-	-
1,2-Dichloroethane-d4	103 (±3.6)	104 (±6.0)	-	-	-	-
Nitrobenzene-d5	-	-	75 (±18)	78 (±22)	-	-
2-Fluorobiphenyl	-	-	76 (±13)	83 (±12)	-	-
p-Terphenyl-d14	-	-	68 (±27)	62 (±23)	-	-
Phenol-d5	-	-	75 (±15)	83 (±12)	-	-
2-Fluorophenol	-	-	71 (±16)	77 (±11)	-	-
2,4,6-Tribromophenol	-	-	70 (±22)	79 (±20)	-	-
Dibutyl chlorendate	-	-	-	-	100 (±7.5)	104 (±7.9)

TABLE 5.12.2.1.1-2

QUALITY CONTROL SUMMARY DATA: ORGANIC PRIORITY POLLUTANT SURROGATE RECOVERY RESULTS OUTSIDE OF QUALITY CONTROL ACCEPTANCE LIMITS

ANALYSIS	NUMBER OUTLIERS/TOTAL NUMBER ANALYSES					
SURROGATE COMPOUND	LOW VOLATILE	MEDIUM VOLATILE	LOW BASE/NEUTRAL/ACID	MEDIUM BASE/NEUTRAL/ACID	LOW PESTICIDE	MEDIUM PESTICIDE
Toluene-d8	0/68	0/7	-	-	-	-
4-Bromofluorobenzene	0/68	0/7	-	-	-	-
1,2-Dichloroethane-d4	3/68	0/7	-	-	-	-
Nitrobenzene-d5	-	-	2/46	0/29	-	-
2-Fluorobiphenyl	-	-	0/46	0/29	-	-
p-Terphenyl-d14	-	-	3/46	0/29	-	-
Phenol-d5	-	-	2/46	0/29	-	-
2-Fluorophenol	-	-	1/46	0/29	-	-
2,4,6-Tribromophenol	-	-	2/46	1/29	-	-
Dibutyl chlorendate	-	-	-	-	32/43	19/32

TABLE 5.12.2.1.1-3

QUALITY CONTROL CHECK FREQUENCIES

SOILS

ANALYSIS/LEVEL	NUMBER SAMPLES ANALYZED	NUMBER MS/MSD PAIRS ANALYZED	QC CHECK FREQUENCY (%)
VOA/Low	68	5	7.4
VOA/Medium	7	2	29
BNA/Low	46	4	8.7
BNA/Medium	29	2	6.9
Pesticide/Low	43	4	9.3
Pesticide/Medium	32	2	6.3
Herbicide	75	5	7.5

TABLE 5.12.2.1.1-4

QUALITY CONTROL SUMMARY DATA
VOLATILE ORGANIC PRIORITY POLLUTANT SPIKE RECOVERY AND DUPLICATE RESULTS
SOILS

	LOW VOA ANALYSIS		MEDIUM VOA ANALYSIS	
SPIKE COMPOUND	AVERAGE % RECOVERY (± Std.Dev.)	AVERAGE RPD (±Std.Dev.)	AVERAGE % RECOVERY (±Std.Dev.)	AVERAGE RPD (±Std.Dev.)
1,1-Dichloroethylene	101 (±9.4)	4.8 (±3.9)	101 (±15)	5.5 (±1.5)
Trichloroethylene	86 (±6.8)	4.6 (±5.7)	90 (±3.5)	6.0 (±3.0)
Benzene	87 (±6.7)	4.0 (±4.0)	79 (±7.5)	4.5 (±0.5)
Toluene	90 (±12)	7.4 (±4.9)	106 (±24.9)	8.5 (±3.5)
Chlorobenzene	85 (±4.3)	4.8 (±6.0)	89 (±4.2)	6.5 (±6.5)

TABLE 5.12.2.1.1-5

QUALITY SUMMARY DATA
BASE/NEUTRAL/ACID PRIORITY POLLUTANT SPIKE RECOVERY AND DUPLICATE RESULTS
SOILS

	LOW BNA ANALYSIS		MEDIUM BNA ANALYSIS	
SPIKE COMPOUND	AVERAGE % RECOVERY (± Std.Dev.)	AVERAGE RPD (±Std.Dev.)	AVERAGE % RECOVERY (±Std.Dev.)	AVERAGE RPD (±Std.Dev.)
1,2,4-Trichlorobenzene	70 (±12)	3.3 (±3.4)	99 (±5.1)	6.0 (±2.0)
Acenaphthene	77 (±7.5)	11 (±5.9)	88 (±8.2)	9.5 (±9.5)
2,6-Dinitrotulene	52 (±5.3)	6.3 (±7.2)	59 (±4.6)	2.0 (±2.0)
Di-n-butylphthalate	83 (±12)	11 (±13)	91 (±12)	4.0 (±2.0)
Pyrene	77 (±9.9)	6.8 (±5.0)	132 (±7.0)	8.0 (±2.0)
N-nitrosodi-n-propylamine	75 (±11)	7.0 (±9.0)	94 (±13)	6.0 (±1.0)
1,4-Dichlorobenzene	81 (±5.3)	4.5 (±5.0)	90 (±1.6)	3.0 (±1.0)
Pentachlorophenol	71 (±15)	12 (±9.1)	100 (±2.6)	3.0 (±3.0)
4-Chloro-3-methylphenol	51 (±7.3)	5.8 (±1.3)	73 (±6.0)	12 (±0.5)
Phenol	70 (±6.1)	9.8 (±1.8)	88 (±0)	1.5 (±1.5)
2-Chlorophenol	73 (±6.8)	11 (±1.9)	90 (±2.1)	4.0 (±0)
4-Nitrophenol	55 (±25)	11 (±9.9)	56 (±39)	16 (±0.5)

TABLE 5.12.2.1.1-6

QUALITY CONTROL SUMMARY DATA
PRIORITY POLLUTANT, PESTICIDE, AND HERBICIDE SPIKE RECOVERY
AND DUPLICATE RESULTS
SOILS

	LOW PESTICIDE ANALYSIS		MEDIUM PESTICIDE ANALYSIS		HERBICIDE ANALYSIS	
SPIKE COMPOUND	AVERAGE % RECOVERY (± Std.Dev.)	AVERAGE RPD (±Std.Dev.)	AVERAGE % RECOVERY (±Std.Dev.)	AVERAGE RPD (±Std.Dev.)	AVERAGE % RECOVERY (±Std.Dev.)	AVERAGE RPD (±Std.Dev.)
Lindane	99 (±10)	6.0 (±3.5)	103 (±2.0)	1.5 (±1.5)	-	-
Heptachlor	100 (±13)	9.0 (±3.1)	111 (±9.0)	7.5 (±7.5)	-	-
Aldrin	96 (±8.2)	6.5 (±3.2)	103 (±12)	12 (±12)	-	-
Dieldrin	100 (±14)	7.0 (±3.5)	110 (±3.6)	3.5 (±0.5)	-	-
Endrin	95 (±5.9)	3.3 (±2.4)	107 (±3.9)	6.0 (±3.0)	-	-
p,p'-DDT	107 (±13)	18 (±10)	NR	3.5 (±3.5)	-	-
Dalapon	-	-	-	-	49 (±39)	21 (±12)
Dicamba	-	-	-	-	71 (±36)	3.5 (±2.0)
Dichloroprop	-	-	-	-	74 (±38)	7.5 (±2.6)
2,4-D	-	-	-	-	61 (±76)	21 (±17)
2,4,5-TP	-	-	-	-	65 (±33)	4.4 (±2.6)
2,4,5-T	-	-	-	-	45 (±26)	16 (±15)
2,4-DB	-	-	-	-	49 (±29)	49 (±38)
Dinoseb	-	-	-	-	0	NC

NR = Not reportable - all percent recoveries outside quality control limits.

NC = not calculatable - all recoveries are zero.

TABLE 5.12.2.1.2-1

QUALITY CONTROL SUMMARY DATA
ORGANIC PRIORITY POLLUTANT SURROGATE
RECOVERY RESULTS
SEDIMENTS

ANALYSIS	AVERAGE PERCENT RECOVERY (±STD.DEV.)					
SURROGATE COMPOUND	LOW VOLATILE	MEDIUM VOLATILE	LOW BNA	MEDIUM BNA	LOW PESTICIDE	MEDIUM PESTICIDE
Toluene-d8	102 (±2.2)	NA	-	-	-	-
4-Bromofluorobenzene	95 (±8.2)	NA	-	-	-	-
1,2-Dichloroethane-d4	101 (±2.0)	NA	-	-	-	-
Nitrobenzene-d5	-	-	92 (±4.7)	93 (±3.3)	-	-
2-Fluorobiphenyl	-	-	67 (±4.1)	71 (±8.5)	-	-
p-Terphenyl-d14	-	-	75 (±9.9)	71 (±21)	-	-
Phenol-d5	-	-	85 (±8.3)	88 (±9.3)	-	-
2-Fluorophenol	-	-	79 (±8.5)	80 (±8.4)	-	-
2,4,6-Tribromophenol	-	-	85 (±10)	83 (±12)	-	-
Dibutyl chlorendate	-	-	-	-	111 (±8.6)	111 (±9.0)

NA = no sediments were analyzed as medium-level VOAs.

TABLE 5.12.2.1.2-2

QUALITY CONTROL SUMMARY DATA
VOLATILE PRIORITY POLLUTANT AND HERBICIDE SPIKE RECOVERY AND DUPLICATE RESULTS
SEDIMENTS

SPIKE COMPOUND	LOW VOLATILE ANALYSIS AVERAGE % RECOVERY (± Std.Dev.)	RPD* (%)	LOW HERBICIDE ANALYSIS AVERAGE % RECOVERY (±Std.Dev.)	RPD* (%)
1,1-Dichloroethylene	150 (±10)	13	-	-
Trichloroethylene	95 (±5)	11	-	-
Benzene	115 (±5)	9	-	-
Toluene	115 (±5)	9	-	-
Chlorobenzene	115 (±5)	9	-	-
Dalapon	-	-	62 (±5)	6
Dicamba	-	-	82 (±2)	2
Dichloroprop	-	-	80 (±5.5)	8
2,4-D	-	-	95 (±12)	12
2,4,5-TP	-	-	73 (±3)	0
2,4,5-T	-	-	69 (±4.5)	19
2,4,5-DB	-	-	47 (±29)	118
Dinoseb	-	-	2.1 (±1.8)	48

*Only one matrix spike/matrix spike duplicate pair was run for each analysis type; therefore, no average RPD is available.

TABLE 5.12.2.1.2-3

QUALITY CONTROL SUMMARY DATA
BASE/NEUTRAL/ACID PRIORITY POLLUTANT SPIKE RECOVERY AND DUPLICATE RESULTS
SEDIMENTS

	LOW BNA ANALYSIS		MEDIUM BNA ANALYSIS	
SPIKE COMPOUND	AVERAGE % RECOVERY (± Std.Dev.)	RPD* (%)	AVERAGE % RECOVERY (±Std.Dev.)	RPD* (%)
1,2,4-Trichlorobenzene	95 (±5)	10	93 (±2)	4
Acenaphthene	78 (±1)	2	79 (±4)	10
2,6-Dinitrotoluene	60 (±1)	3	53 (±2)	7
Di-n-butylphthalate	88 (±0)	0	87 (±1)	2
Pyrene	NR	0	75 (±0)	0
N-nitrosodi-n-propylamine	95 (±1)	2	100 (±7)	14
1,4-Dichlorobenzene	77 (±0)	0	80 (±1)	2
Pentachlorophenol	76 (±2.5)	6	85 (±1)	2
4-Chloro-3-methylphenol	74 (±2.5)	7	80 (±1.5)	4
Phenol	83 (±0)	0	84 (±3)	7
2-Chlorophenol	83 (±0)	0	79 (±4)	10
4-Nitrophenol	23 (±0.5)	7	25 (±0.5)	4

*Only one MS/MSD pair was run for each analysis type; therefore, no average RPD is available.

NR = not reportable - both recoveries are outside quality control limits.

TABLE 5.12.2.1.2-4

QUALITY CONTROL SUMMARY DATA
PRIORITY POLLUTANT PESTICIDE SPIKE RECOVERY
AND DUPLICATE RESULTS
SEDIMENTS

SPIKE COMPOUND	LOW PESTICIDE ANALYSIS		MEDIUM PESTICIDE ANALYSIS	
	AVERAGE % RECOVERY (± Std.Dev.)	RPD* (%)	AVERAGE % RECOVERY (±Std.Dev.)	RPD* (%)
Lindane	90 (±2.5)	7	102 (±4)	8
Heptachlor	105 (±1.5)	3	106 (±3)	6
Aldrin	95 (±2)	4	100 (±2.5)	6
Dieldrin	94 (±2)	4	78 (±1.5)	7
Endrin	112 (±2)	3	120 (±1.5)	3
p,p'-DDT	107 (±3.5)	7	117 (±1)	2

---

*Only one MS/MSD pair was run for each analysis type; therefore, no average RPD is available.

TABLE 5.12.2.1.3-1

QUALITY CONTROL SUMMARY DATA
ORGANIC PRIORITY POLLUTANT SURROGATE
RECOVERY RESULTS
WATERS

ANALYSIS	AVERAGE % RECOVERY (±STD.DEV.)		
SURROGATE COMPOUND	LOW VOLATILE	LOW BNA	LOW PESTICIDE
Toluene-d8	102 (±4.2)	-	-
4-Bromofluorobenzene	99 (±4.6)	-	-
1,2-Dichloroethane-d4	103 (±4.3)	-	-
Nitrobenzene-d5	-	80 (±12)	-
2-Fluorobiphenyl	-	62 (±9.3)	-
p-Terphenyl-d14	-	46 (±10)	-
Phenol-d5	-	62 (±14)	-
2-Fluorophenol	-	50 (±11)	-
2,4,6-Tribromophenol	-	55 (±15)	-
Dibutyl chlorendate	-	-	89 (±18)

TABLE 5.12.2.1.3-2

QUALITY CONTROL SUMMARY DATA
ORGANIC PRIORITY POLLUTANT SURROGATE
WATER RECOVERY RESULTS
OUTSIDE OF QUALITY CONTROL
ACCEPTANCE LIMITS

ANALYSIS	NUMBER OF OUTSIDE RECOVERIES/TOTAL NUMBER OF ANALYSES		
SURROGATE COMPOUND	LOW VOLATILE	LOW BNA	LOW PESTICIDE
Toluene-d8	0/24	-	-
4-Bromofluorobenzene	0/24	-	-
1,2-Dichloroethane-d4	0/24	-	-
Nitrobenzene-d5	-	8/24	-
2-Fluorobiphenyl	-	8/24	-
p-Terphenyl-d14	-	8/24	-
Phenol-d5	-	7/24	-
2-Fluorophenol	-	7/24	-
2,4,6-Tribromophenol	-	8/24	-
Dibutyl chlorendate	-	-	18/24

TABLE 5.12.2.1.3-3

QUALITY CONTROL DATA
ORGANIC PRIORITY POLLUTANT SPIKE RECOVERY
AND DUPLICATE RESULTS
WATERS

SPIKE COMPOUND	LOW VOLATILE ANALYSIS		LOW BNA ANALYSIS		LOW PESTICIDE ANALYSIS	
	AVERAGE % RECOVERY (± Std.Dev.)	AVERAGE RPD (±Std.Dev.)	AVERAGE % RECOVERY (±Std.Dev.)	AVERAGE RPD (±Std.Dev.)	AVERAGE % RECOVERY (±Std.Dev.)	RPD* (%)
1,1-Dichloroethylene	110 (±4.1)	2 (±0)	-	-	-	-
Trichloroethylene	103 (±8.4)	5 (±1)	-	-	-	-
Benzene	98 (±2.6)	5 (±1)	-	-	-	-
Toluene	104 (±6.3)	10 (±3.5)	-	-	-	-
Chlorobenzene	102 (±5.0)	9 (±4.5)	-	-	-	-
1,2,4-Trichlorobenzene	-	-	63 (±4.1)	3.5 (±3.5)	-	-
Acenaphthene	-	-	62 (±1.9)	5.5 (±2.5)	-	-
2,6-Dinitrotulene	-	-	47 (±14)	6.5 (±0.5)	-	-
Di-n-butylphthalate	-	-	37 (±2.7)	13 (±3.5)	-	-
Pyrene	-	-	59 (±16)	15 (±6.5)	-	-
N-nitrosodi-n-propylamine	-	-	70 (±11)	3.5 (±3.5)	-	-
,4-Dichlorobenzene	-	-	55 (±1.2)	2 (±2)	-	-
Pentachlorophenol	-	-	73 (±3.9)	7.5 (±0.5)	-	-
-Chloro-3-methylphenol	-	-	54 (±7.9)	4 (±1)	-	-
Phenol	-	-	66 (±11)	6 (±2)	-	-
-Chlorophenol	-	-	72 (±9.2)	7 (±0)	-	-
-Nitrophenol	-	-	65 (±7.5)	6.5 (±1.5)	-	-
Lindane	-	-	-	-	72 (±1.5)	4
Heptachlor	-	-	-	-	68 (±5)	14
Aldrin	-	-	-	-	69 (±4)	11
Dieldrin	-	-	-	-	75 (±2.5)	7
Endrin	-	-	-	-	81 (±1.5)	4
p,p'-DDT	-	-	-	-	78 (±3.5)	9

Only one MS/MSD pair was run for this analysis type; therefore, an average RPD is not available.

TABLE 5.12.2.2-1

QUALITY CONTROL CHECK SAMPLE FREQUENCIES
INORGANIC/CLASSICAL ANALYSES

SAMPLE MATRIX	TOTAL NUMBER OF SAMPLES ANALYZED	NUMBER OF SAMPLE SPIKES	PERCENT FREQUENCY (%)	NUMBER OF BLIND SPLITS	PERCENT FREQUENCY (%)
Soil	75	5	6.7	5	6.7
Sediment	15	1	6.7	1	6.7
Water	24	2	8.3	2	8.3

TABLE 5.12.2.2-2

QUALITY CONTROL SUMMARY DATA INORGANIC PARAMETERS SPIKE RECOVERY AND DUPLICATE RESULTS

MATRIX PARAMETER	AVERAGE % RPD (±STD.DEV.) WATER	 SOIL	AVERAGE % RPD (±STD.DEV.) WATER AND SOIL
Antimony	133 (±33)	24 (±27)	105 (±31)
Arsenic	70 (±33)	28 (±20)	113 (±25)
Berylluim	27 (±2)	9.8 (±10)	102 (±7.3)
Cadmium	20 (±13)	15 (±14)	95 (±7.1)
Chromium	74 (±74)	15 (±10)	94 (±7.0)
Copper	16 (±11)	20 (±16)	102 (±7.0)
Lead	16 (±8)	20 (±17)	105 (±6.8)
Mercury	60 (±60)	43 (±37)	107 (±24)
Nickel	11 (±4)	28 (±16)	112 (±6.5)
Selenium	0	0	92 (±19)
Silver	9 (±9)	3.7 (±8.2)	99 (±6.7)
Thallium	0	0	104 (±7.8)
Zinc	13 (±10)	13 (±5)	105 (±7.9)

TABLE 5.12.2.3-1

LABORATORY DUPLICATE RESULTS SUMMARY
2,3,7,8-TCDD

SAMPLE TYPE	ORIGINAL RESULT (ppb)	DUPLICATE RESULT (ppb)	RPD (%)
Chip	2.0	1.8	10
Chip	ND (0.08)*	ND(0.23)	0
Sediment	0.53	0.55	3.7
Chip	9.2	14	40
Sediment	0.60	1.1	58
Chip	ND(0.28)	ND(0.54)	0
Sediment	1.7	1.4	19
Soil	ND(0.30)	ND(0.09)	0
Bulk	3.0	2.5	18
Chip	76.8	77.5	0.9
Chip	43.2	58.5	30
Chip	18.1	18.1	0
Chip	0.93	1.0	7.3
Soil	2.5	1.7	38
Soil	2.4	1.2	70
Soil	5.8	4.6	23
Soil	2.2	2.9	27
Soil	193.	214	10
Soil	0.39	0.30	26
Soil	217.	223	2.7
Soil	7.3	6.1	18
Soil	3.4	3.3	3.0
Soil	268.	257.	4.2
Soil	33.4	26	25
Sediment	450.	646	36
Soil	0.27	0.16	51
Drum	10,200.	9150.	11

*The numbers in parentheses represent the detection limits.

TABLE 5.12.2.3-2

LABORATORY SPIKE RECOVERY RESULTS SUMMARY

DIOXIN

SAMPLE TYPE	ORIGINAL RESULT (ppb)	+	AMOUNT SPIKED (ppb)	=	THEORET. CONC SAMPLE + SPIKE (ppb)	SPIKE RESULT (ppb)	PERCENT RECOVERY
Chip	ND		1.0		1.0	0.77	77
Sediment	0.53		1.0		1.5	1.3	87
Sediment	0.60		1.0		1.6	1.4	88
Chip	ND		1.0		1.0	1.0	100
Sediment	1.7		1.0		2.7	2.2	82
Soil	ND		1.0		1.0	1.2	120
Chip	0.93		1.0		1.9	2.4	126
Soil	2.2		1.0		3.2	2.7	84
Soil	0.39		1.0		1.4	1.6	114
Soil	0.27		17.0		17.3	18.1	105
Soil	2.5		1.0		3.5	2.5	71
Soil	2.4		1.0		3.4	2.4	71
Soil	5.8		1.0		6.8	6.5	96
Soil	3.4		1.0		4.4	3.5	80

TABLE 5.12.3.1-1

PROGRAM QC BLANK SAMPLE RESULTS
2,3,7,8-TCDD ANALYSIS

SAMPLE NUMBER	MATRIX	DATE SHIPPED TO LAB	RESULT
9900-1458-W-L	Wipe	10-15-84	ND (3.6 ng/wipe)
9900-1459-W-L	Wipe	10-15-84	(2)
9900-1460-W-L	Wipe	10-15-84	ND(3.8 ng/wipe)
Q-1-C-1464-100-S-L	Soil	10-15-84	0.76 ppb
Q-1-C-1465-100-S-L	Soil	10-15-84	1.6 ppb
Q-1-C-1466-100-S-L	Soil	10-15-84	0.89 ppb
9900-1470-H-Y	Water	10-19-84	ND(0.002 ppb)

(1)Detection limit is cited in the parentheses.

(2)Sample lost during preparation - no results available.

TABLE 5.12.3.2-1

PROGRAM QC BLANK SPIKE SAMPLE RESULTS
2,3,7,8-TCDD ANALYSIS

SAMPLE NUMBER	MATRIX	DATE ASSIGNED	SPIKE LEVEL	RESULT	% RECOVERY
9900-1461-W-L	Wipe	10-15-84	40 ng/wipe	34.9 ng/wipe	87.
9900-1462-W-L	Wipe	10-15-84	40 ng/wipe	34.7 ng/wipe	87.
9900-1463-W-L	Wipe	10-15-84	40 ng/wipe	38.5 ng/wipe	96.
Q-1-C-1467-100-S-L	Soil	10-15-84	671. ppb	725. ppb	108.
Q-1-C-1468-100-S-L	Soil	10-15-84	671. ppb	878.ppb	131.
Q-1-C-1469-100-S-L	Soil	10-15-84	671. ppb	780. ppb	116.

TABLE 5.12.3.3-1

ITAS SAMPLE SPLIT RESULTS SUMMARY
2,3,7,8-TCDD ANALYSIS

ORIGINAL/SPLIT SAMPLE NOS.	MATRIX	ORIGINAL RESULT (ppb)	SPLIT RESULT (ppb)	RPD (ppb)
L0111/L0112	Chip	0.70	0.95	30
L0890/L0891(1)	Chip	1.25	1.20	4
L0894/L0895(1)	Chip	ND (0.78)(4)	ND (0.48)	0
L1039/L1049	Soil	3510.(2)	824.(2)	120
		1500.(3)	1300.(3)	14
L1517/L1519	Soil	1.2	0.7	53
L1661/L1663	Soil	453.(2)	526.(2)	15
		460.(3)	440.(3)	4
Y1038/Y1048	Soil	350.(2)	1030.(2)	98
		350.(3)	449.(3)	25
Y1333/Y1339	Soil	326.(2)	462.(2)	34
		296.(3)	249.(3)	18
Y1471/Y1474	Soil	3.6	1.8	66
Y1359/Y1371	Water	0.68	0.18	116

(1) These samples were collected from the Sergeant site, concurrently with the 80 Lister Avenue sampling.

(2) One gram sample aliquot result.

(3) Ten gram sample aliquot result.

(4) Detection limit indicated in parentheses.

TABLE 5.12.4-1

NJDEP-DESIGNATED SPLIT SAMPLES

ITC SAMPLE NUMBER	SAMPLE TYPE	ITAS REQUIRED ANALYSES	NJDEP SPLIT SAMPLE NUMBER
1-1-0-0301-300-M-L	Sediment	Dioxin	9300-0286-300-M-J
1-6-9-0312-300-M-L	Sediment	Dioxin	9300-0287-300-M-J
4506-0425-C-L	Chip	Dioxin	9300-0429-C-J
4506-0426-C-L	Chip	Dioxin	9300-0430-C-J
0265-0573-D-L	Drum	HazCat	ETC No. F5470A
0266-0574-D-L	Drum	HazCat	ETC No. F5471A
0267-0575-D-L	Drum	HazCat	ETC No. F5472A
0268-0576-D-L	Drum	HazCat	ETC No. F5473A
0269-0577-D-L	Drum	HazCat	ETC No. F5474A
0270-0578-D-L	Drum	HazCat	ETC No. F5475A
0271-0579-D-L	Drum	HazCat	ETC No. F5476A
0272-0580-D-L	Drum	HazCat	ETC No. F5477A
0273-0581-D-L	Drum	HazCat	ETC No. F5478A
0274-0582-D-L	Drum	HazCat	ETC No. F5479A
0275-0583-D-L	Drum	HazCat	ETC No. F5480A
0276-0584-D-L	Drum	HazCat	ETC No. F5481A
0277-0585-D-L	Drum	HazCat	ETC No. F5482A
0278-0586-D-L	Drum	HazCat	ETC No. F5483A
0279-0587-D-L	Drum	HazCat	ETC No. F5484A
0280-0588-D-L	Drum	HazCat	ETC No. F5485A
0281-0589-D-L	Drum	HazCat	ETC No. F5486A
0282-0590-D-L	Drum	HazCat	ETC No. F5487A
0437-0924-D-L	Drum	HazCat	ETC No. F5488A
0438-0925-D-L	Drum	HazCat/Dioxin	ETC No. F5489A
0439-0926-D-L	Drum	HazCat	ETC No. F5490A
0440-0927-D-L	Drum	HazCat	ETC No. F5491A
0441-0928-D-L	Drum	HazCat	ECT No. F5492A
0442-0929-D-L	Drum	HazCat	ETC No. F5493A
0443-0930-D-L	Drum	HazCat	ETC No. F5494A
0444-0931-D-L	Drum	HazCat	ETC No. F5495A
0450-0937-D-L	Drum	HazCat/Dioxin	No ETC No. recorded
0451-0938-D-L	Drum	HazCat	No ETC No. recorded
0452-0939-D-L	Drum	HazCat	No ETC No. recorded
0453-0940-D-L	Drum	HazCat	No ETC No. recorded
I-7K-1038-100-S-Y	Soil	All parameters	ETC No. 6506 & 6508
8012-1323-Z-L	Sewer	Dioxin	ETC No. F5467A
G-5-F-1448-100-S-Y	Soil	All parameters	ETC No. F7608A & F7606E
A-4-F-1516-100-S-Y	Soil	All parameters	ETC No. F7603E
A-4-F-1517-101-S-L	Soil	Dioxin	No ETC No. recorded
G-3-I-1577-101-S-L	Soil	Dioxin	No ETC No. recorded

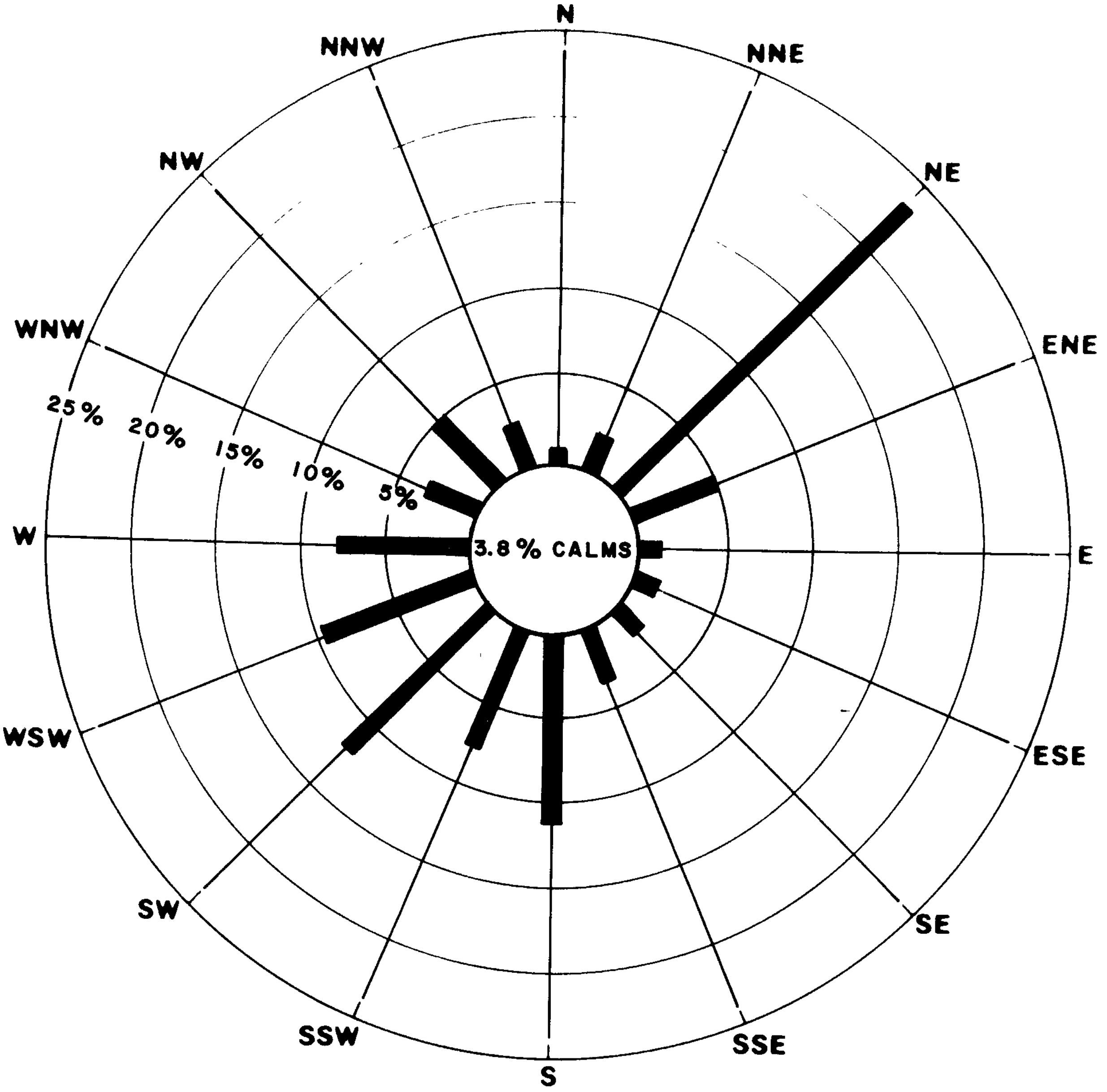
TABLE 5.12.4-2

NJDEP SOIL PROFICIENCY SAMPLE RESULTS

CLIENT NUMBER	SORT	SAMPLE DESCRIPTION	RESULTS
9400-1549-S-L	841012	A010-Blank Spike	1.7 ppb
9400-1550-S-L	841012	A011	1.2 ppb
9400-1551-S-L	841012	A012	3.6 ppb
9400-1552-S-L	841012	A013	492 ppb
9400-1592-S-L	841015	A016	502 ppb
9400-1593-S-L	841015	A017	541 ppb
9400-1594-S-L	841015	A018	1.1 ppb
9400-1595-S-L	841015	A019-Blank Spike	1.5 ppb
9400-1475-S-L	841016	A020-Blank Spike	1.7 ppb
9400-1476-S-L	841016	A021	4.4 ppb
9400-1477-S-L	841016	A022	1.1 ppb
9400-1478-S-L	841016	A023	511 ppb
9400-1653-S-L	841017	A024-Blank Spike	1.7 ppb
9400-1654-S-L	841017	A025	4.2 ppb
9400-1655-S-L	841017	A026	1.2 ppb
9400-1656-S-L	841017	A027	393 ppb
9400-1675-S-L	841018	A028-Blank Spike	1.8 ppb
9400-1676-S-L	841018	A029	4.5 ppb
9400-1677-S-L	841018	A030	1.4 ppb
9400-1678-S-L	841018	A031	595 ppb
9400-1733-S-L	841019	A032-Blank Spike	1.6 ppb
9400-1734-S-L	841019	A033	ND (0.76 ppb)
9400-1735-S-L	841019	A034	554 ppb
9400-1736-S-L	841029	A035	500 ppb
9400-1762-S-L	841022	A036-Blank Spike	1.9 ppb
9400-1781-S-L	841023	A038-Blank Spike	1.6 ppb
9400-1782-S-L	841023	A039	367 ppb

FIGURES

DRAWN BY J.LOGRECO 2-13-85
CHECKED BY JJO 2-5-85
APPROVED BY DGE 2-5-85
DRAWING NUMBER 846248-A50



NOTE:
SITE DATA BASED ON INFORMATION ACQUIRED 9/7/84 THROUGH 10/9/84.

FIGURE 5.1-1

SITE INVESTIGATION
WIND ROSE
BASED ON SITE DATA
PREPARED FOR

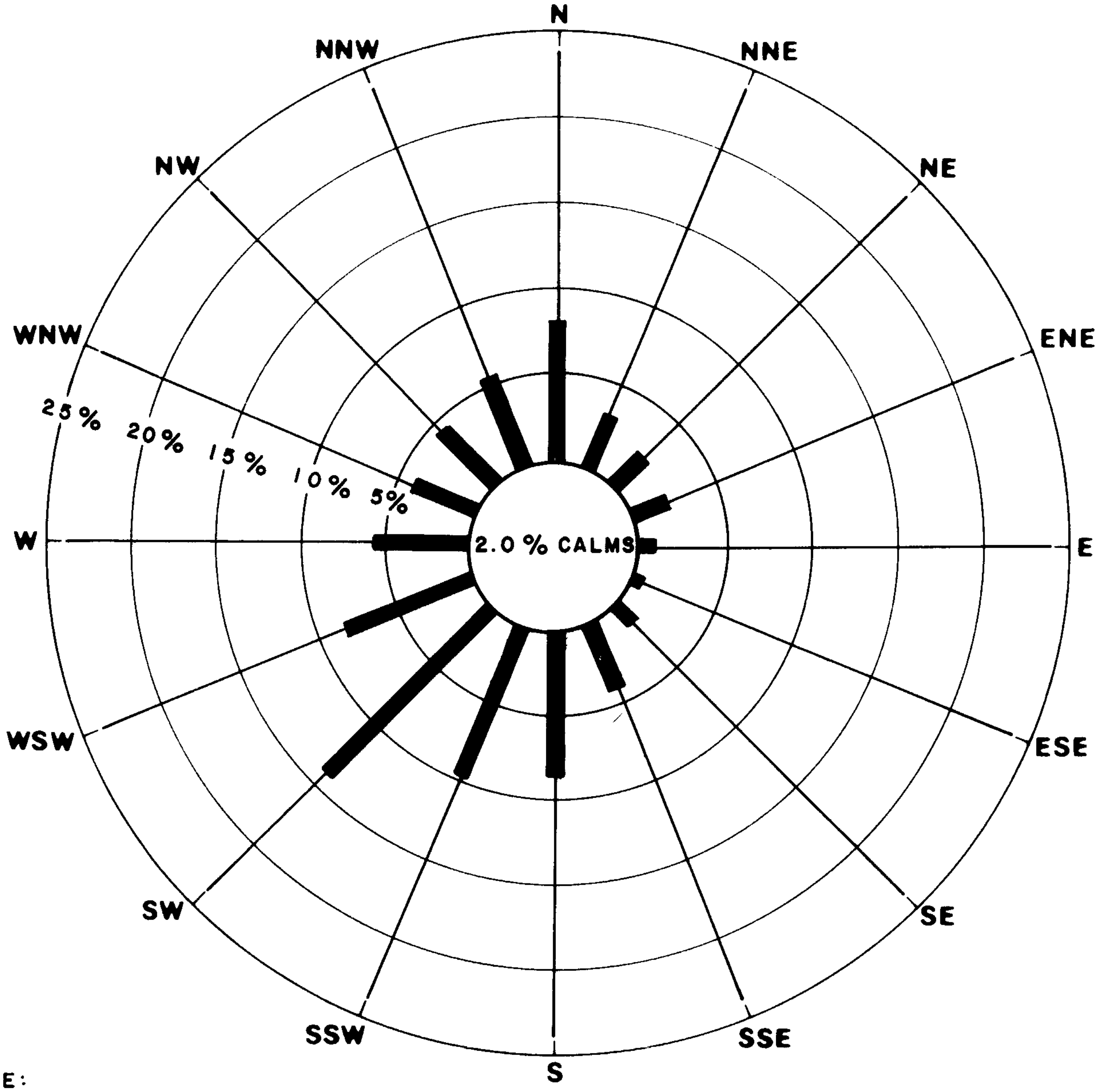
DIAMOND SHAMROCK
DALLAS, TEXAS

65360

Do Not Scale This Drawing

IT Creating a Safer Tomorrow

DRAWN BY J. LOGRECO 2-13-85 | CHECKED BY TTD [illegible] | APPROVED BY RGE 2-5-85 | DRAWING NUMBER 846248-A51



NOTE:
DATA ACQUIRED FROM
NEWARK AIRPORT
9/7/84 THROUGH 10/9/84.

FIGURE 5.1-2

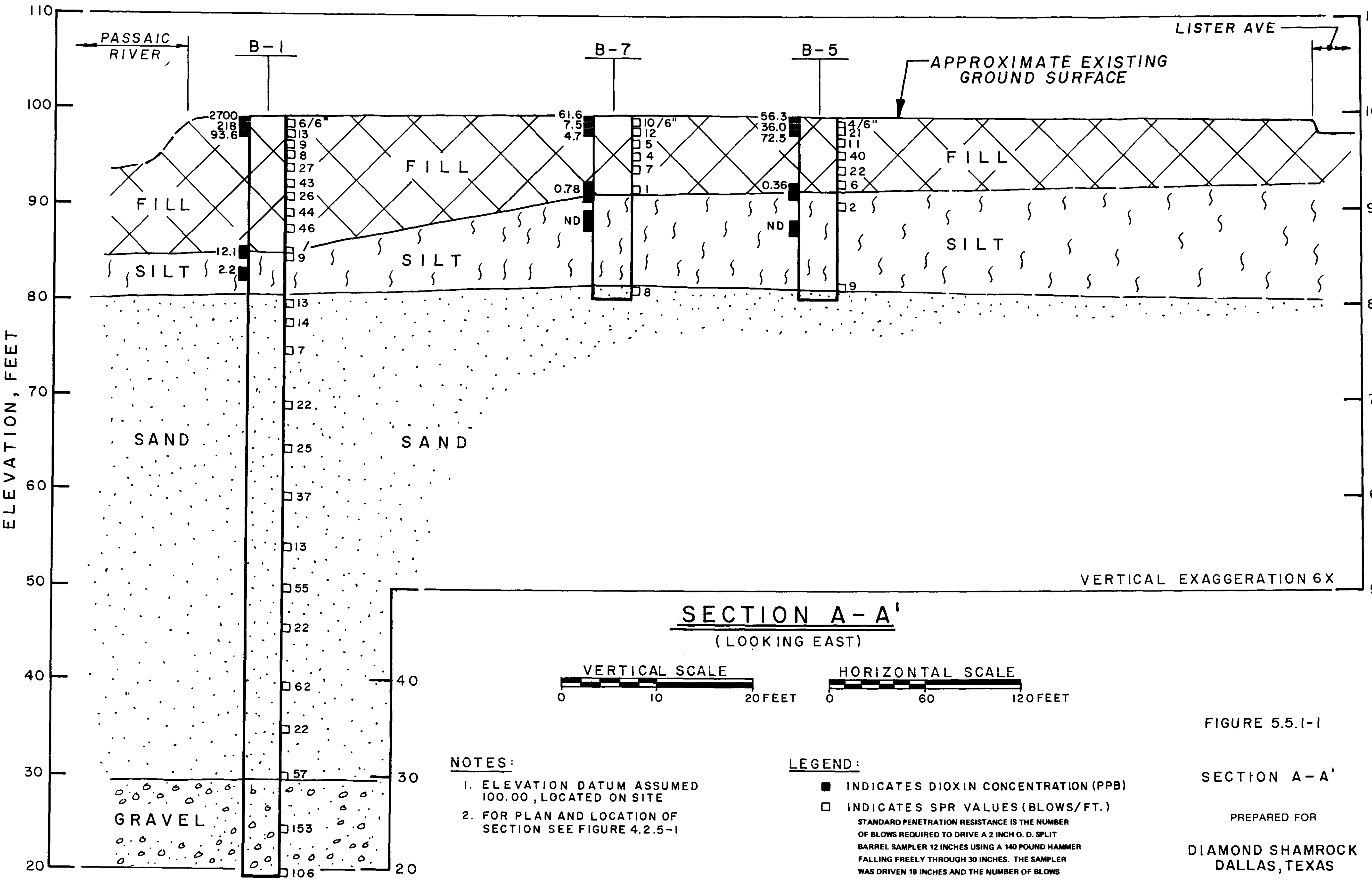
SITE INVESTIGATION
WIND ROSE
BASED ON
NATIONAL WEATHER SERVICE DATA

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

IT Creating a Safer Tomorrow



SECTION A-A'

(LOOKING EAST)

NOTES:

1. ELEVATION DATUM ASSUMED 100.00, LOCATED ON SITE
2. FOR PLAN AND LOCATION OF SECTION SEE FIGURE 4.2.5-1

LEGEND:

■ INDICATES DIOXIN CONCENTRATION (PPB)

☐ INDICATES SPR VALUES (BLOWS/FT.)
STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2 INCH O. D. SPLIT BARREL SAMPLER 12 INCHES USING A 140 POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER WAS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6 INCH INTERVAL. THE RESISTANCE TO PENETRATION IS INDICATED ON THE DRAWING AS BLOWS PER FOOT.

FIGURE 5.5.1-1

SECTION A-A'

PREPARED FOR

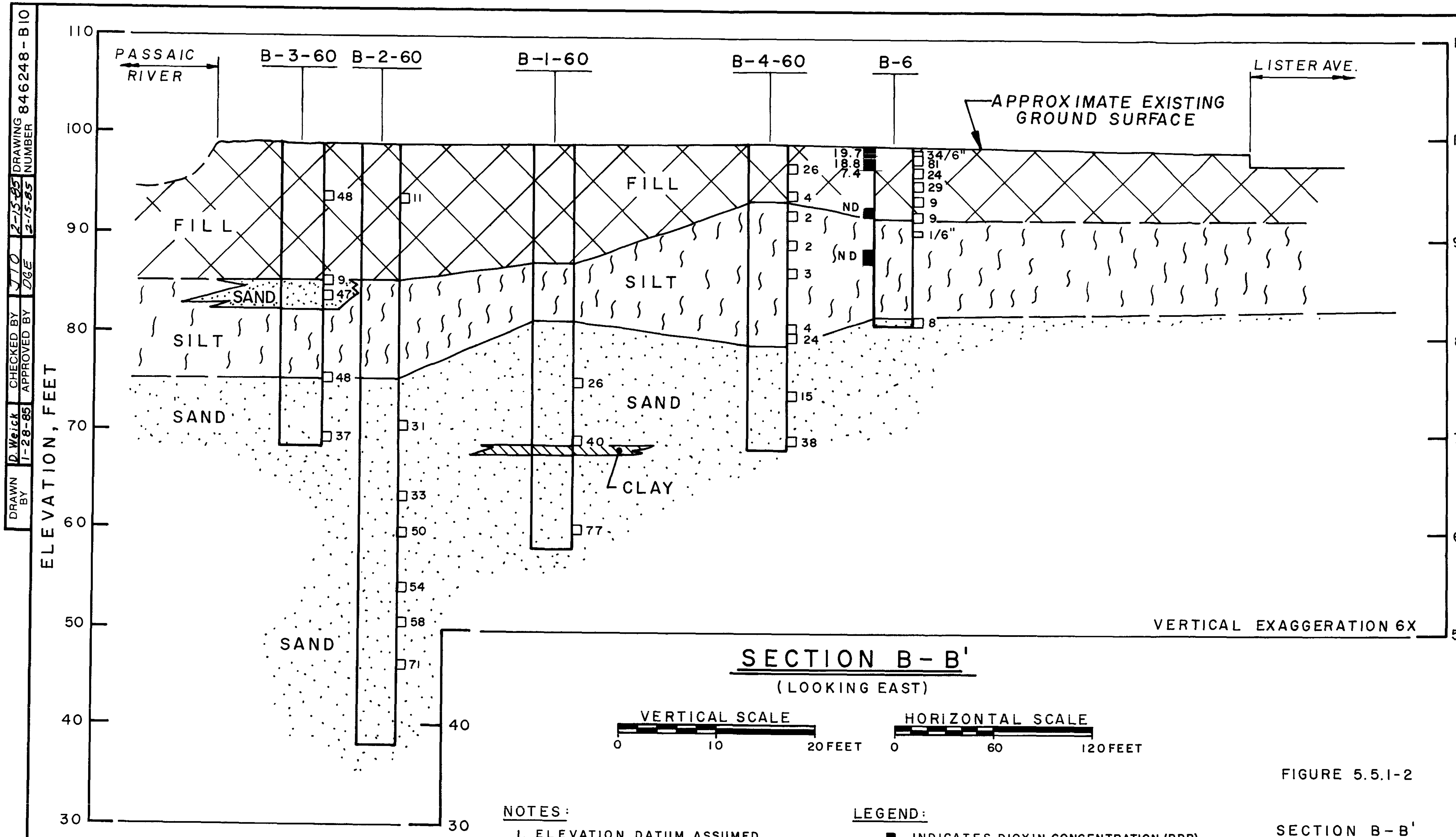
DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

DRAWN BY	D. Weick	1-28-85	CHECKED BY	JTD	2-15-85	DRAWING NUMBER	846248-B9
			APPROVED BY	DGE	2-15-85		

65360

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
D. Weick 1-28-85	JTO 2-15-85	DGE 2-15-85	846248-B10



SECTION B-B'

(LOOKING EAST)

NOTES:

1. ELEVATION DATUM ASSUMED 100.00, LOCATED ON SITE
2. FOR PLAN AND LOCATION OF SECTION SEE FIGURE 4.2.5-1

LEGEND:

■ INDICATES DIOXIN CONCENTRATION (PPB)

☐ INDICATES SPR VALUES (BLOWS/FT.)
STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2 INCH O. D. SPLIT BARREL SAMPLER 12 INCHES USING A 140 POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER WAS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6 INCH INTERVAL. THE RESISTANCE TO PENETRATION IS INDICATED ON THE DRAWING AS BLOWS PER FOOT.

FIGURE 5.5.1-2

SECTION B-B'

PREPARED FOR

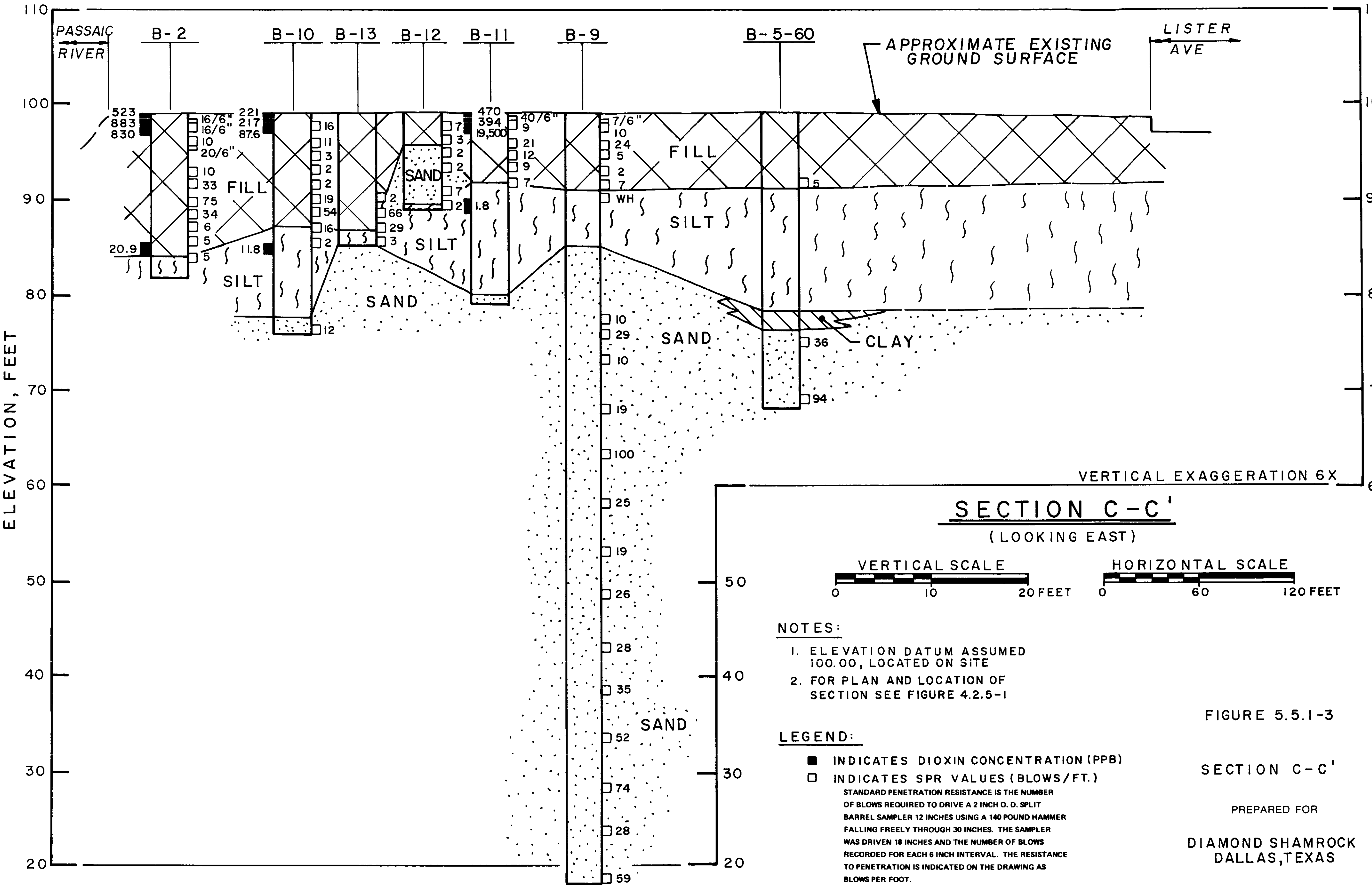
DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

65360

"Do Not Scale This Drawing"

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
D.Weick 1-29-85	JTO 2-13-85	DGE 2-15-85	846248 - B11



SECTION C-C'

(LOOKING EAST)

VERTICAL SCALE 0 10 20 FEET

HORIZONTAL SCALE 0 60 120 FEET

NOTES:

1. ELEVATION DATUM ASSUMED 100.00, LOCATED ON SITE
2. FOR PLAN AND LOCATION OF SECTION SEE FIGURE 4.2.5-1

LEGEND:

■ INDICATES DIOXIN CONCENTRATION (PPB)

☐ INDICATES SPR VALUES (BLOWS/FT.)

STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2 INCH O. D. SPLIT BARREL SAMPLER 12 INCHES USING A 140 POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER WAS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6 INCH INTERVAL. THE RESISTANCE TO PENETRATION IS INDICATED ON THE DRAWING AS BLOWS PER FOOT.

FIGURE 5.5.1-3

SECTION C-C'

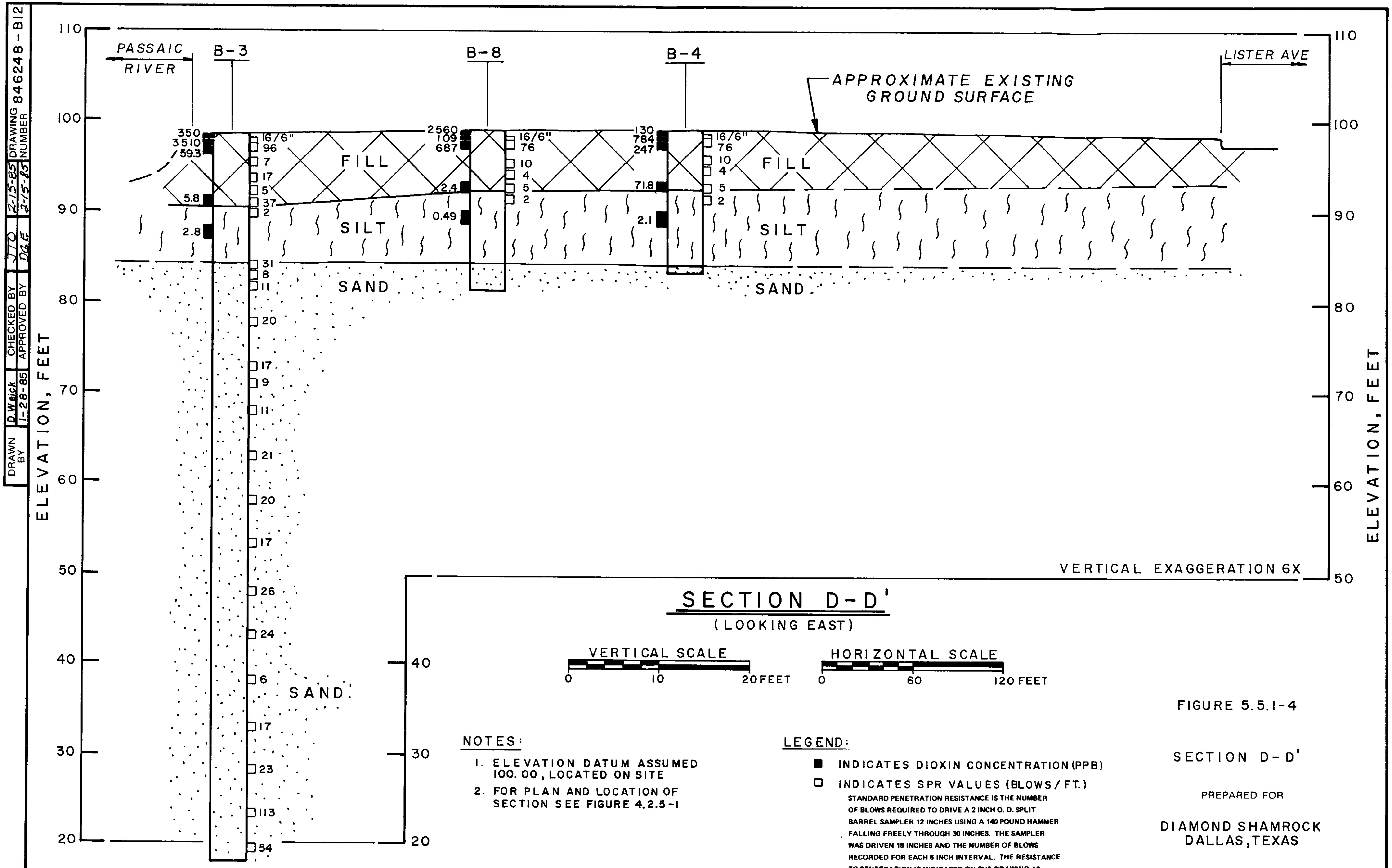
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

65380

"Do Not Scale This Drawing"



SECTION D-D'

(LOOKING EAST)

NOTES:

1. ELEVATION DATUM ASSUMED 100.00, LOCATED ON SITE
2. FOR PLAN AND LOCATION OF SECTION SEE FIGURE 4.2.5-1

LEGEND:

■ INDICATES DIOXIN CONCENTRATION (PPB)

☐ INDICATES SPR VALUES (BLOWS/FT.)

STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2 INCH O. D. SPLIT BARREL SAMPLER 12 INCHES USING A 140 POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER WAS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6 INCH INTERVAL. THE RESISTANCE TO PENETRATION IS INDICATED ON THE DRAWING AS BLOWS PER FOOT.

FIGURE 5.5.1-4

SECTION D-D'

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

DRAWN BY	D.Weick	CHECKED BY	JTO	2-15-85
	1-28-85	APPROVED BY	DGE	2-15-85

DRAWING NUMBER 846248-B12

65360

"Do Not Scale This Drawing"

DRAWING NUMBER 846248-A49

CHECKED BY

APPROVED BY

DRAWN BY D.Weick 1-29-85

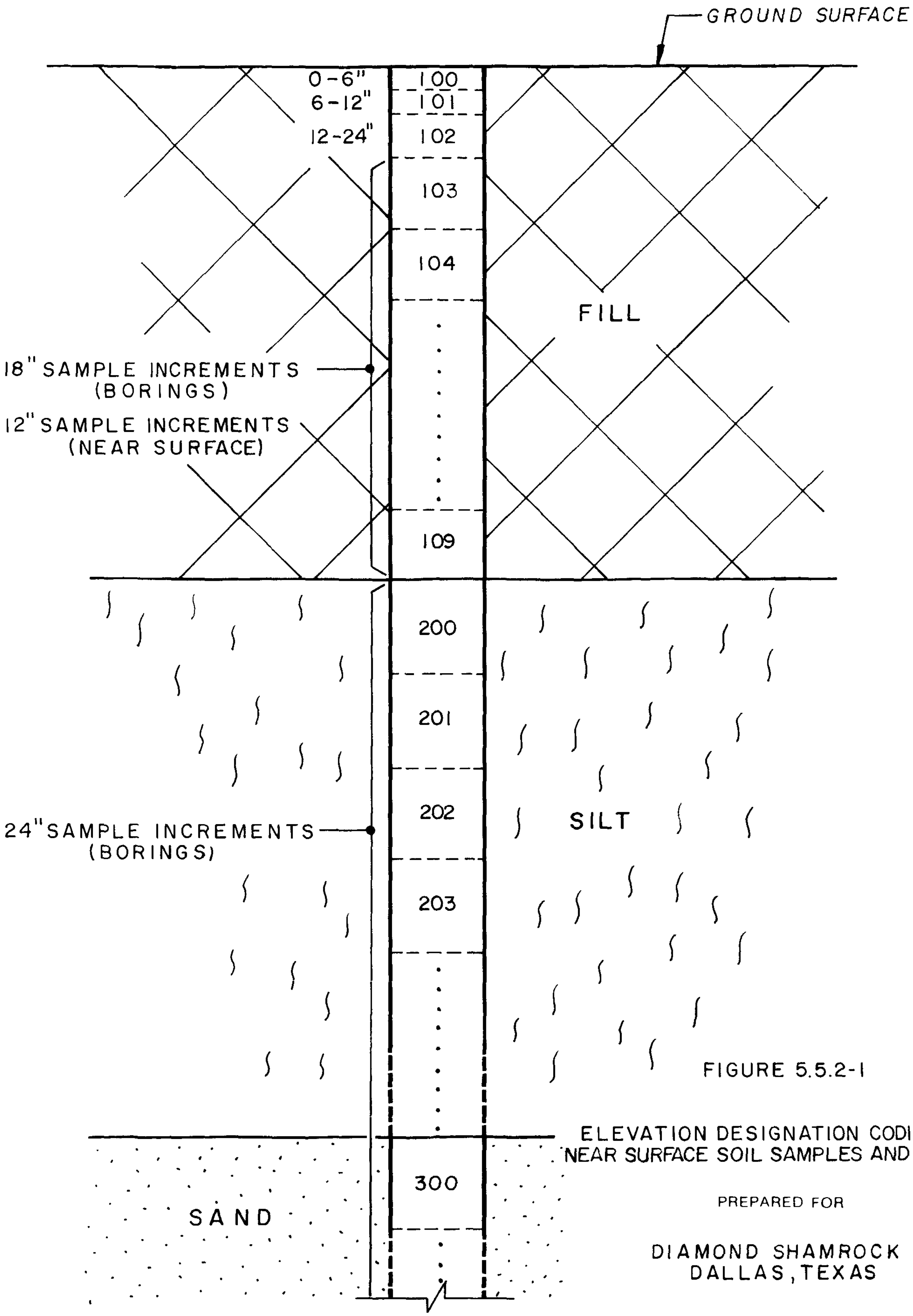


FIGURE 5.5.2-1

ELEVATION DESIGNATION CODING FOR NEAR SURFACE SOIL SAMPLES AND BORINGS

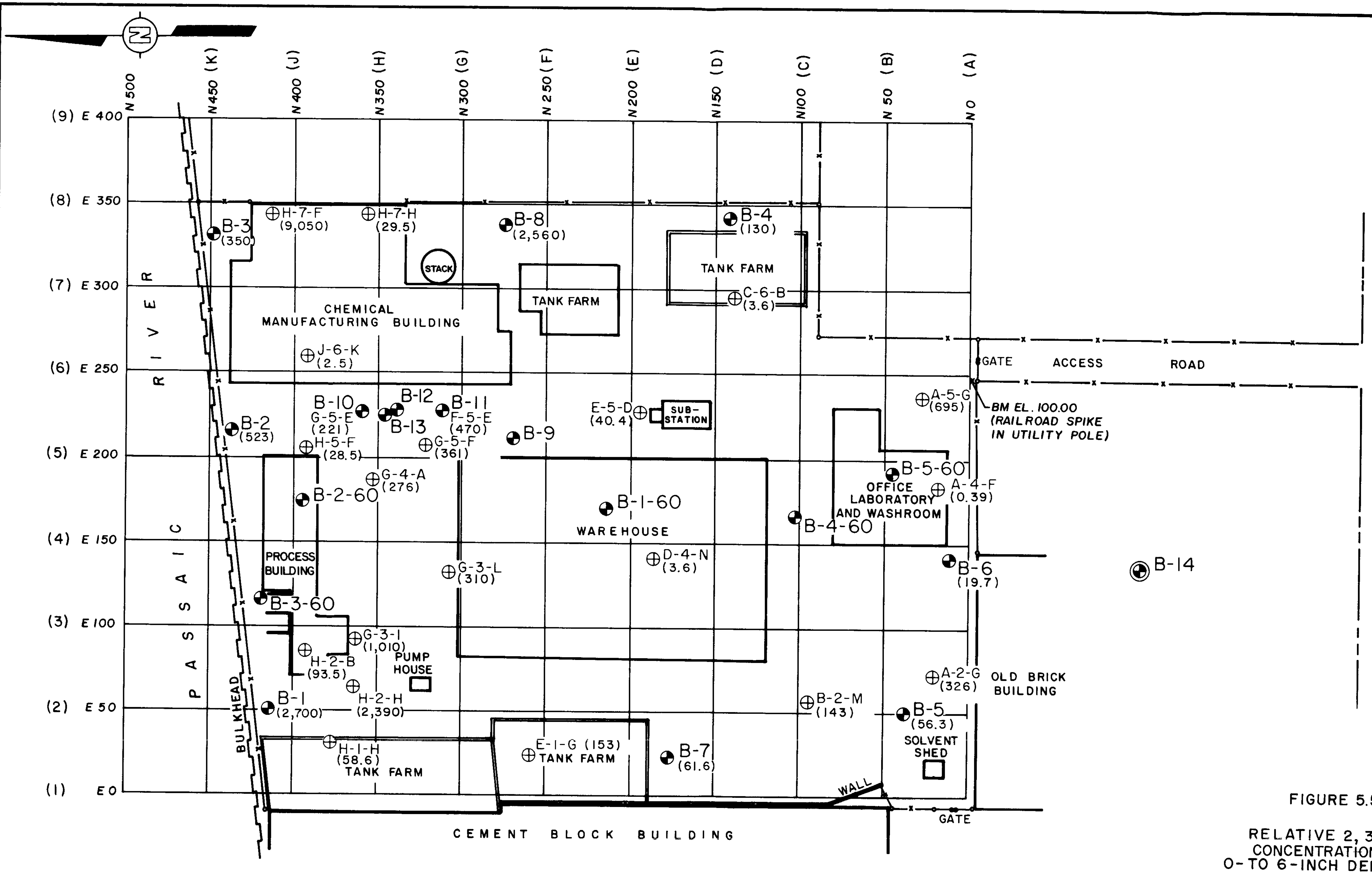
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

Do Not Scale This Drawing



LEGEND:

B-7 ● BORING LOCATION AND NUMBER

E-5-D ⊕ NEAR SURFACE SOIL SAMPLE AND NUMBER

(56.3) INDICATES CONCENTRATIONS, (PPB)

NOTE:

RESULTS ARE FROM ANALYSES OF 100 SERIES SAMPLES, SEE FIGURE 5.5.2-1.

SCALE

0 60 120 FEET

FIGURE 5.5.2.1-1

RELATIVE 2, 3, 7, 8-TCDD CONCENTRATIONS IN SOILS 0-TO 6-INCH DEPTH INTERVAL

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

100% IIB	DRAWN RW	1-29-85	CHECKED BY JTO 2-15-85	APPROVED BY DGE 2-15-85	DRAWING NUMBER 846248-B31
ORG. IIB	BY				

65360

"Do Not Scale This Drawing"

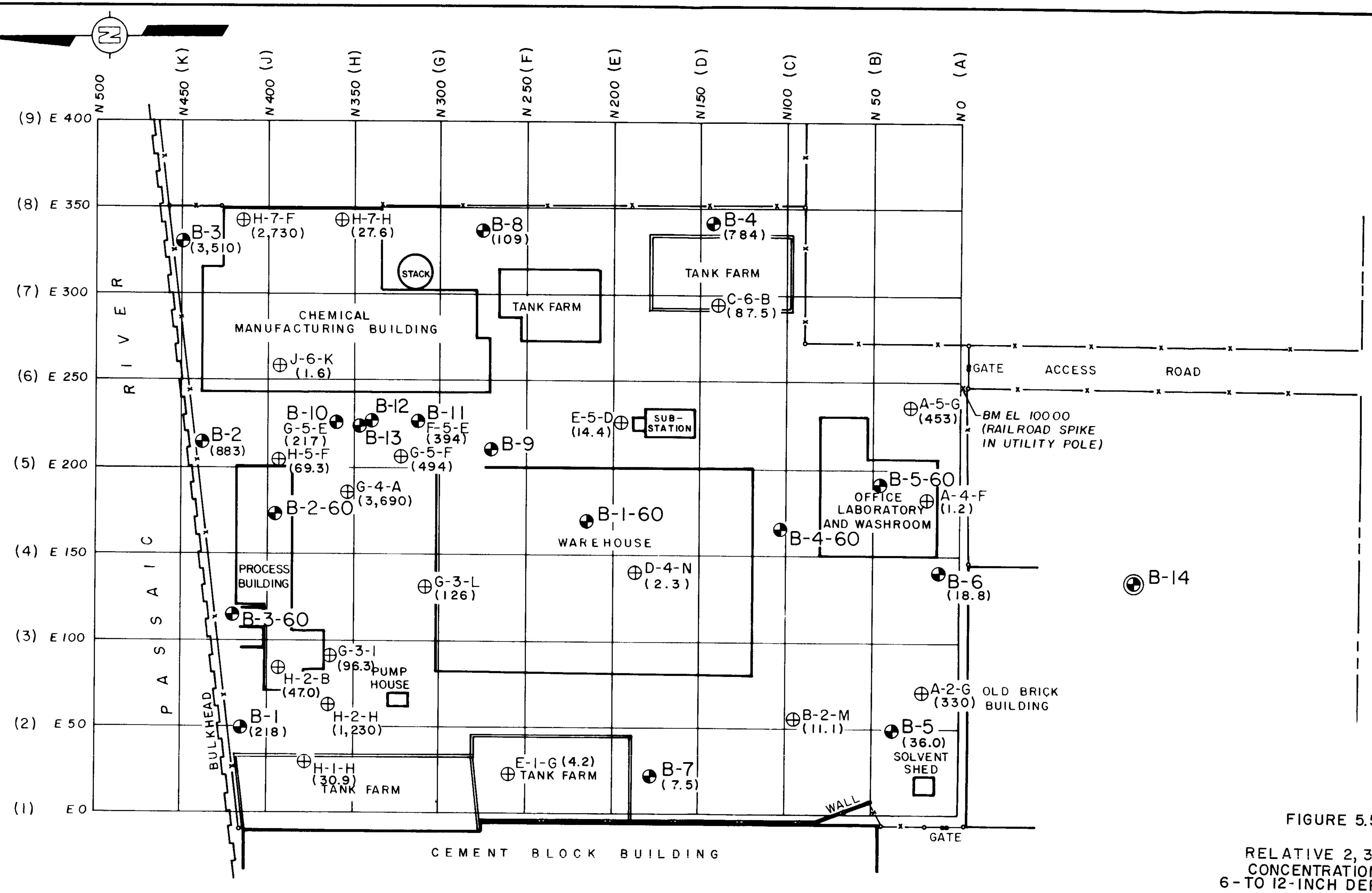


FIGURE 5.5.2.1-2

RELATIVE 2, 3, 7, 8-TCDD CONCENTRATIONS IN SOILS 6-TO 12-INCH DEPTH INTERVAL

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

LEGEND:

B-7 ● BORING LOCATION AND NUMBER

E-5-D ⊕ NEAR SURFACE SOIL SAMPLE AND NUMBER

(36.0) INDICATES CONCENTRATIONS, (PPB)

NOTE:

RESULTS ARE FROM ANALYSES OF 101 SERIES SAMPLES, SEE FIGURE 5.5.2-1.

SCALE

0 60 120 FEET

IT ... Creating a Safer Tomorrow

100% 12B	DRAWN BY	RW	1-29-85	CHECKED BY	JTO	2-15-85	DRAWING NUMBER
ORG. 12B				APPROVED BY	DGE	2-15-85	846248-B32

65360

Do Not Scale This Drawing

100% 13B	DRAWN BY	RW/DAW	1-29-85
ORG. 13B	CHECKED BY	JTO	2-15-85
	APPROVED BY	DGE	2-15-85
	DRAWING NUMBER	846248-B33	

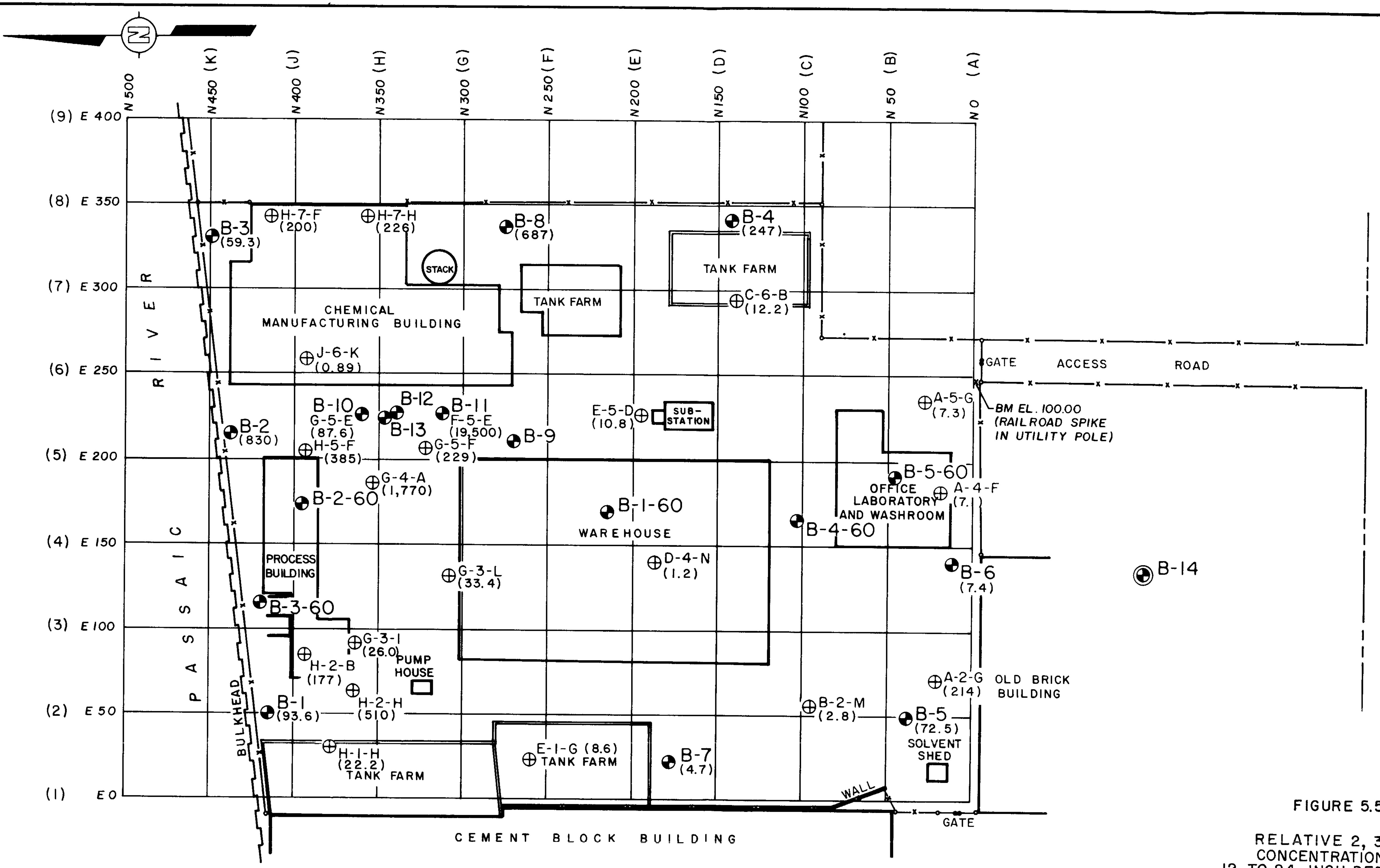


FIGURE 5.5.2.1-3

RELATIVE 2, 3, 7, 8-TCDD
CONCENTRATIONS IN SOILS
12-TO 24-INCH DEPTH INTERVAL

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

LEGEND:

B-7 ●	BORING LOCATION AND NUMBER
E-5-D ⊕	NEAR SURFACE SOIL SAMPLE AND NUMBER
(72.5)	INDICATES CONCENTRATIONS, (PPB)

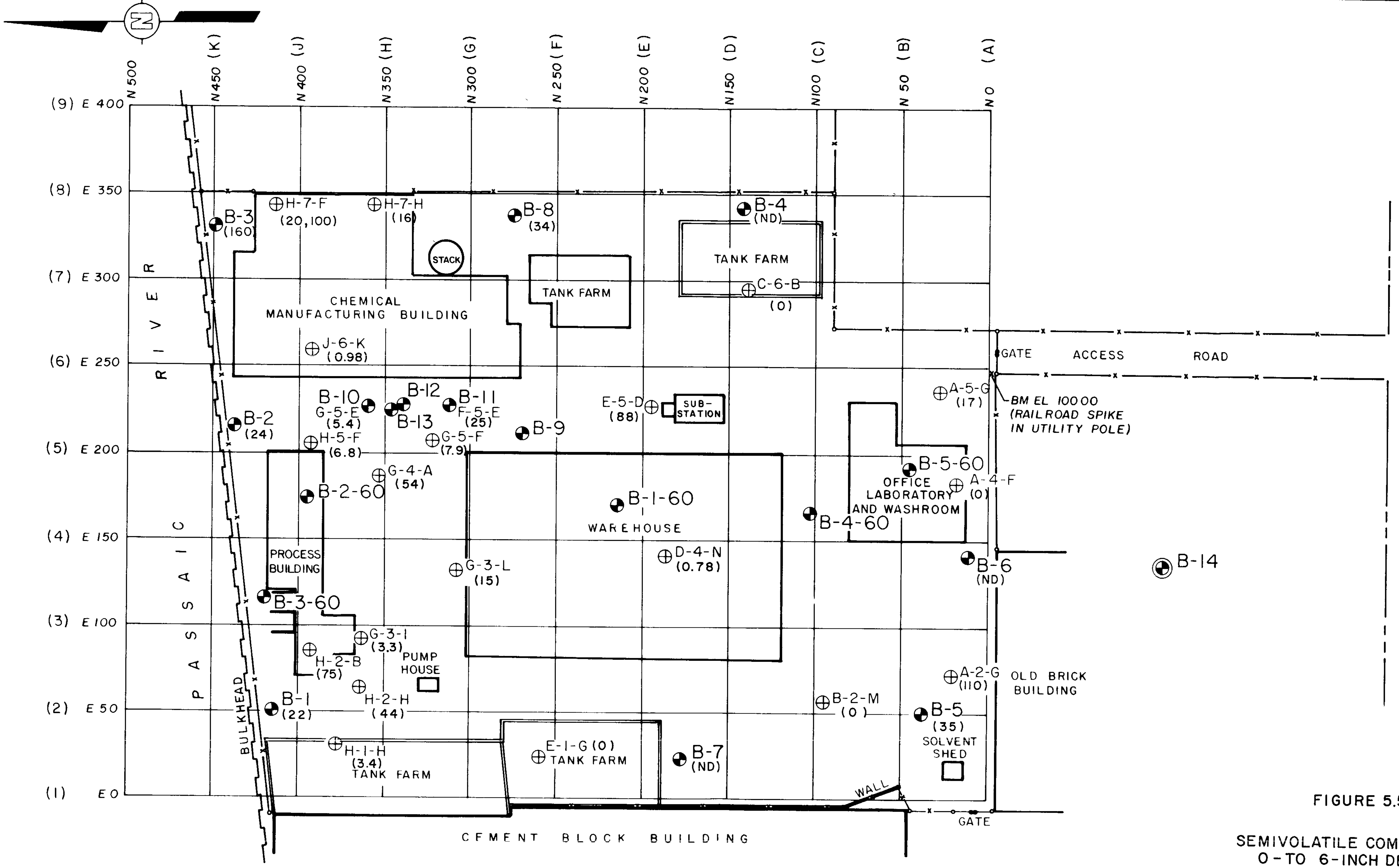
NOTE:
RESULTS ARE FROM ANALYSES OF 102 SERIES SAMPLES, SEE FIGURE 5.5.2-1.

SCALE
0 60 120 FEET

IT ... Creating a Safer Tomorrow

65360

"Do Not Scale This Drawing"



LEGEND:

B-7 ● BORING LOCATION AND NUMBER

E-5-D ⊕ NEAR SURFACE SOIL SAMPLE AND NUMBER

(75) SEMIVOLATILE COMPOUND CONCENTRATIONS (CONCENTRATIONS ARE ÷1000 µG/KG)

NOTES:

1. SEMIVOLATILE COMPOUNDS ARE:
   - 2,4,5-TRICHLOROPHENOL
   - 2,4,6-TRICHLOROPHENOL
   - 2,4-DICHLOROPHENOL
   - HEXACHLOROBENZENE
2. RESULTS ARE FROM ANALYSES OF 100 SERIES SAMPLES, SEE FIGURE 5.5.2-1.

SCALE

0 60 120 FEET

FIGURE 5.5.2.1-4

SEMIVOLATILE COMPOUNDS IN SOILS
0-TO 6-INCH DEPTH INTERVAL

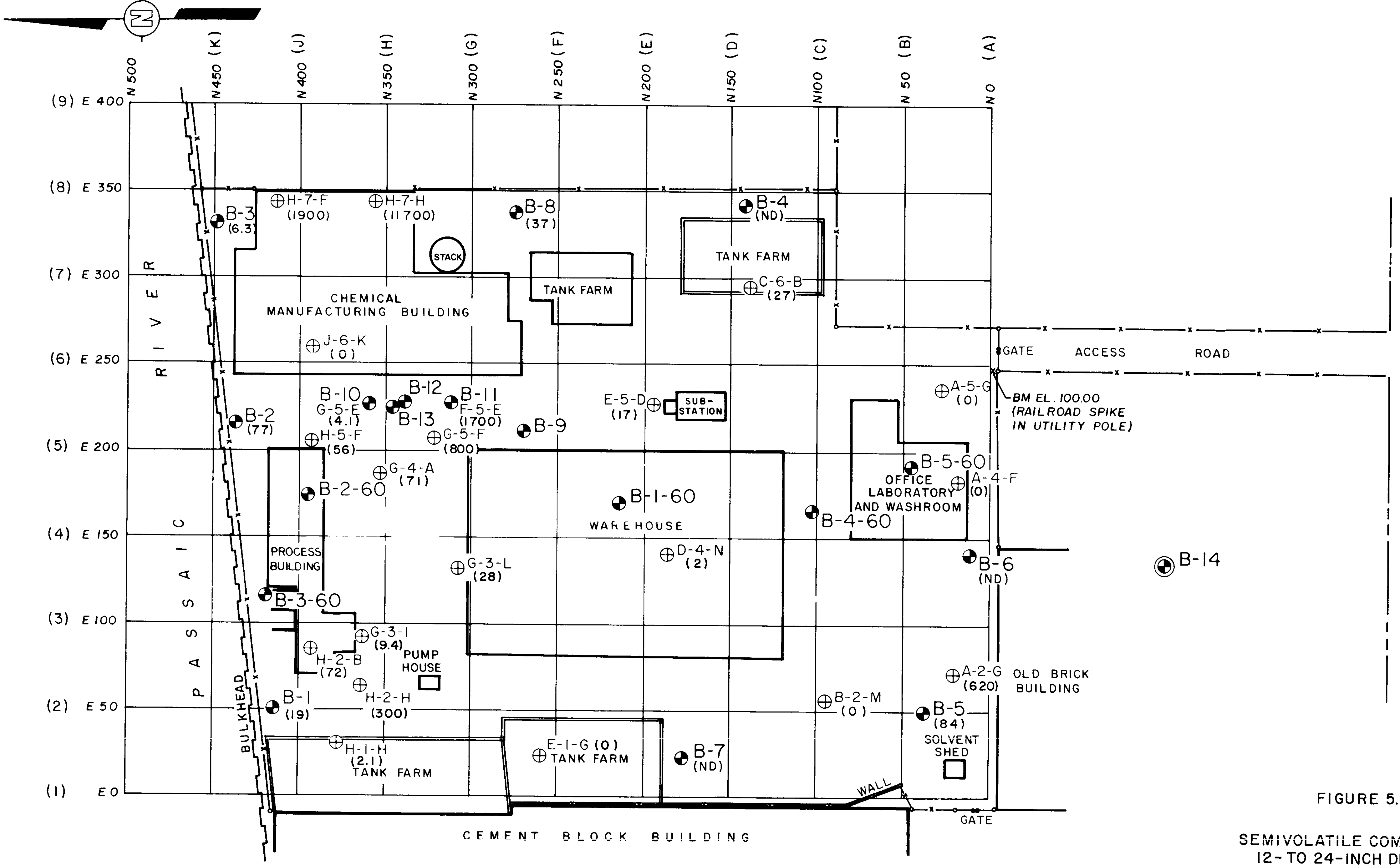
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

100%	5B	DRAWN BY	RW/DAW	CHECKED BY	JTO	2-15-85	DRAWING NUMBER
ORG	5B		1-29-85	APPROVED BY	DGE	2-15-85	846248-B27



LEGEND:

B-7 ●	BORING LOCATION AND NUMBER
E-5-D ⊕	NEAR SURFACE SOIL SAMPLE AND NUMBER
(4.1)	SEMIVOLATILE COMPOUND CONCENTRATIONS (CONCENTRATIONS ARE ÷ 1000 μG/KG)

NOTES:

1. SEMIVOLATILE COMPOUNDS ARE:
   2,4,5-TRICHLOROPHENOL
   2,4,6-TRICHLOROPHENOL
   2,4-DICHLOROPHENOL
   HEXACHLOROBENZENE
2. RESULTS ARE FROM ANALYSES OF 102 SERIES SAMPLES, SEE FIGURE 5.5.2-1.

SCALE

0 60 120 FEET

FIGURE 5.5.2.1-5

SEMIVOLATILE COMPOUNDS IN SOILS
12- TO 24-INCH DEPTH INTERVAL

PREPARED FOR

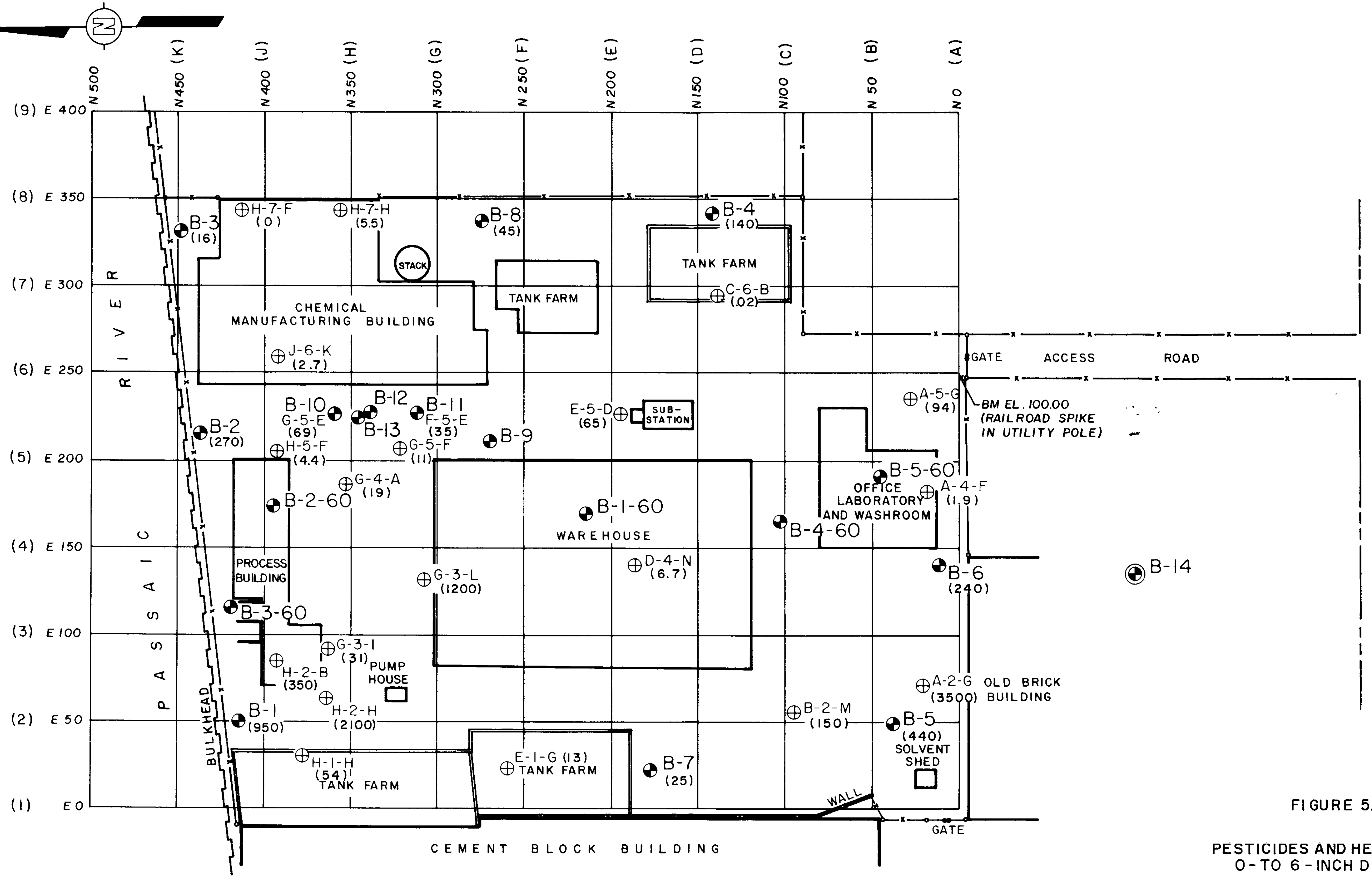
DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

Do Not Scale This Drawing

65360

100% 6B	DRAWN BY	RW/DAW	CHECKED BY	J.T.O. 2-15-85	DRAWING NUMBER 846248-B28
ORG. 6B		1-29-85	APPROVED BY	DG.E. 2-15-85	



LEGEND:

B-7 ● BORING LOCATION AND NUMBER

E-5-D ⊕ NEAR SURFACE SOIL SAMPLE AND NUMBER

(950) PESTICIDES AND HERBICIDES CONCENTRATIONS (CONCENTRATIONS ARE ÷ 1000 μG/KG)

NOTES:

1. PESTICIDES AND HERBICIDES ARE:
   4,4'-DDT, 2,4-D
   4,4'-DDE, 2,4,5-T
   4,4'-DDD
   DALAPON
2. RESULTS ARE FROM ANALYSES OF 100 SERIES SAMPLES, SEE FIGURE 5.5.2-1.

SCALE

0 60 120 FEET

FIGURE 5.5.2.1-6

PESTICIDES AND HERBICIDES IN SOILS
0-TO 6-INCH DEPTH INTERVAL

PREPARED FOR

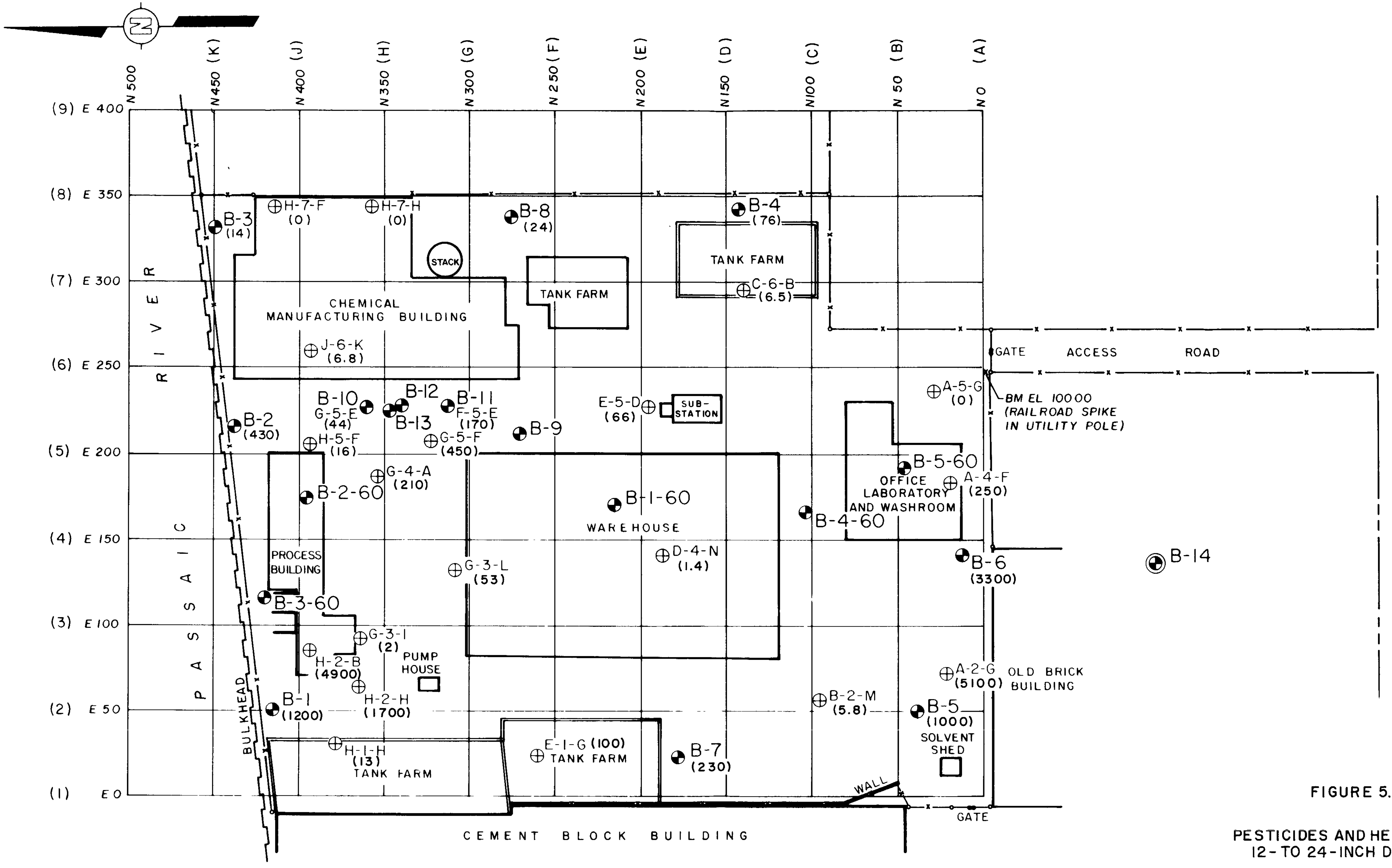
DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

Do Not Scale This Drawing

65360

ORG. 100% 7B	DRAWN BY	RW/DAW 1-29-85	CHECKED BY / APPROVED BY	JJC DGE	2-15-85 2-15-85	DRAWING NUMBER 846248-B29



LEGEND:

B-7 ● BORING LOCATION AND NUMBER

E-5-D ⊕ NEAR SURFACE SOIL SAMPLE AND NUMBER

(5.8) PESTICIDES AND HERBICIDES CONCENTRATIONS (CONCENTRATIONS ARE ÷1000 $\mu G/KG$)

NOTES:

1. PESTICIDES AND HERBICIDES ARE:
   4,4'-DDT, 2,4-D
   4,4'-DDE, 2,4,5-T
   4,4'-DDD
   DALAPON
2. RESULTS ARE FROM ANALYSES OF 102 SERIES SAMPLES, SEE FIGURE 5.5.2-1.

SCALE

0 60 120 FEET

FIGURE 5.5.2.1-7

PESTICIDES AND HERBICIDES IN SOILS
12- TO 24-INCH DEPTH INTERVAL

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

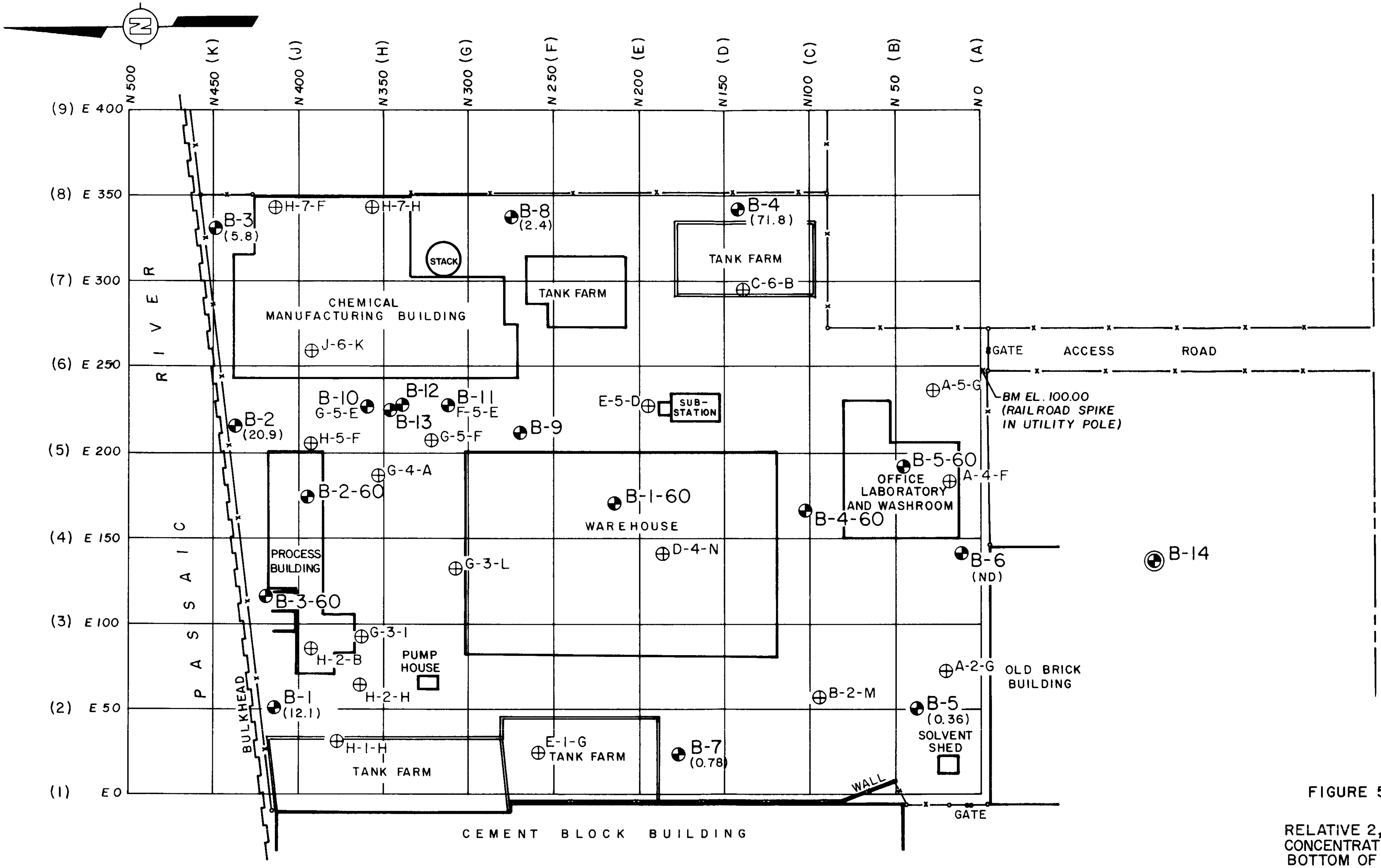
IT ... Creating a Safer Tomorrow

Do Not Scale This Drawing

65360

100% BB	DRAWN BY	RW/DAW	CHECKED BY	JTO	2-15-85
ORG. BB		1-29-85	APPROVED BY	DGE	2-15-85

DRAWING NUMBER 846248-B30



LEGEND:

B-7 ● BORING LOCATION AND NUMBER

E-5-D ⊕ NEAR SURFACE SOIL SAMPLE AND NUMBER

(5.8) INDICATES CONCENTRATIONS, (PPB)

NOTE:

RESULTS ARE FROM ANALYSES
OF 109 SERIES SAMPLES,
SEE FIGURE 5.5.2-1.

SCALE
0 60 120 FEET

FIGURE 5.5.2.2-1

RELATIVE 2, 3, 7, 8-TCDD
CONCENTRATIONS IN SOILS
BOTTOM OF FILL LAYER

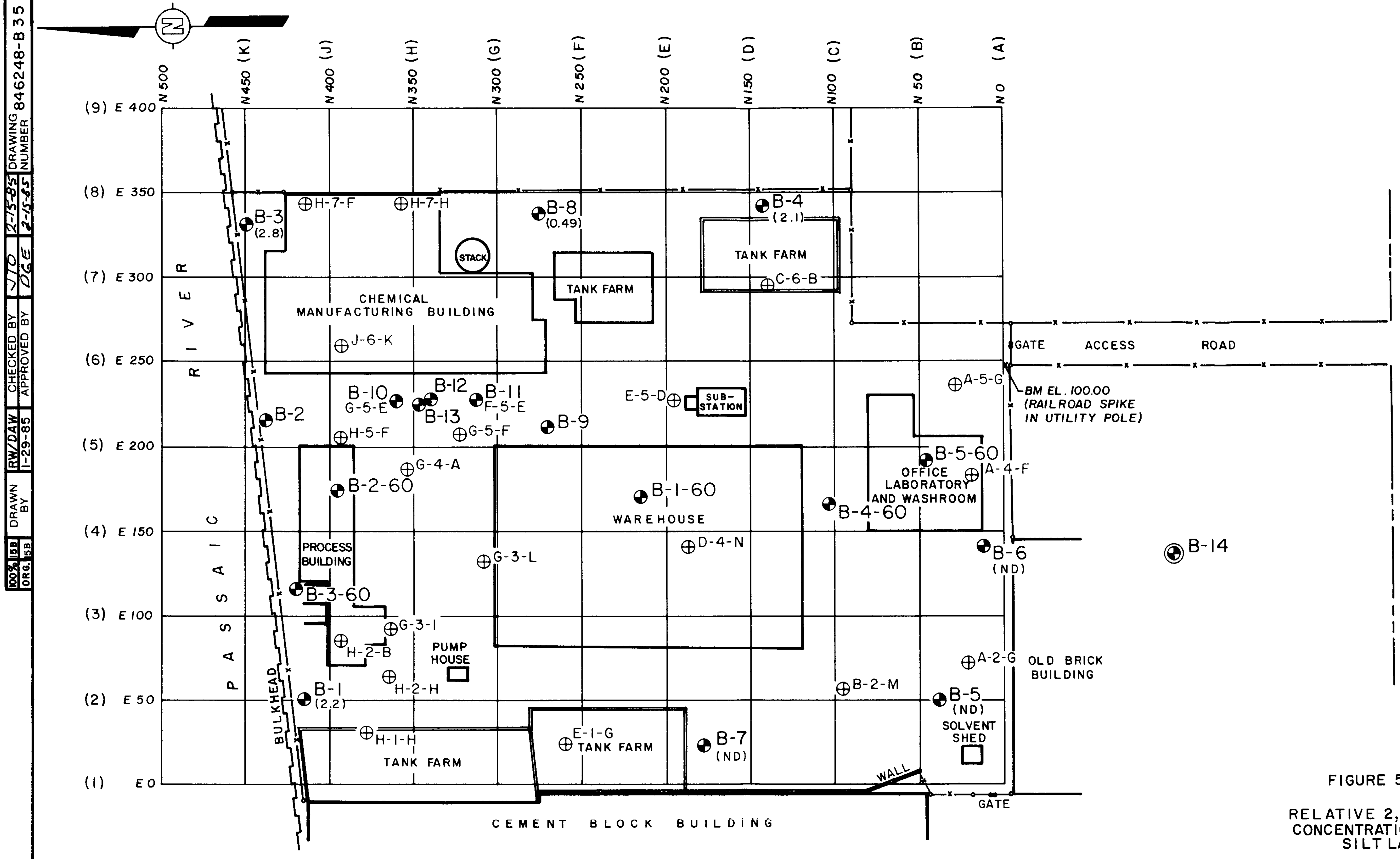
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

100% 14B ORG. 14B	DRAWN BY	RW/DAW 1-29-85	CHECKED BY APPROVED BY	JTD DGE	2-15-85 2-15-85	DRAWING NUMBER 846248-B34

65360



LEGEND:

B-7 ● BORING LOCATION AND NUMBER

E-5-D ⊕ NEAR SURFACE SOIL SAMPLE AND NUMBER

(2.8) INDICATES CONCENTRATIONS, (PPB)

NOTE:

RESULTS ARE FROM ANALYSES OF 201 SERIES SAMPLES, SEE FIGURE 5.5.2-1.

SCALE

0 60 120 FEET

FIGURE 5.5.2.2-2

RELATIVE 2,3,7,8-TCDD CONCENTRATIONS IN SOILS SILT LAYER

PREPARED FOR

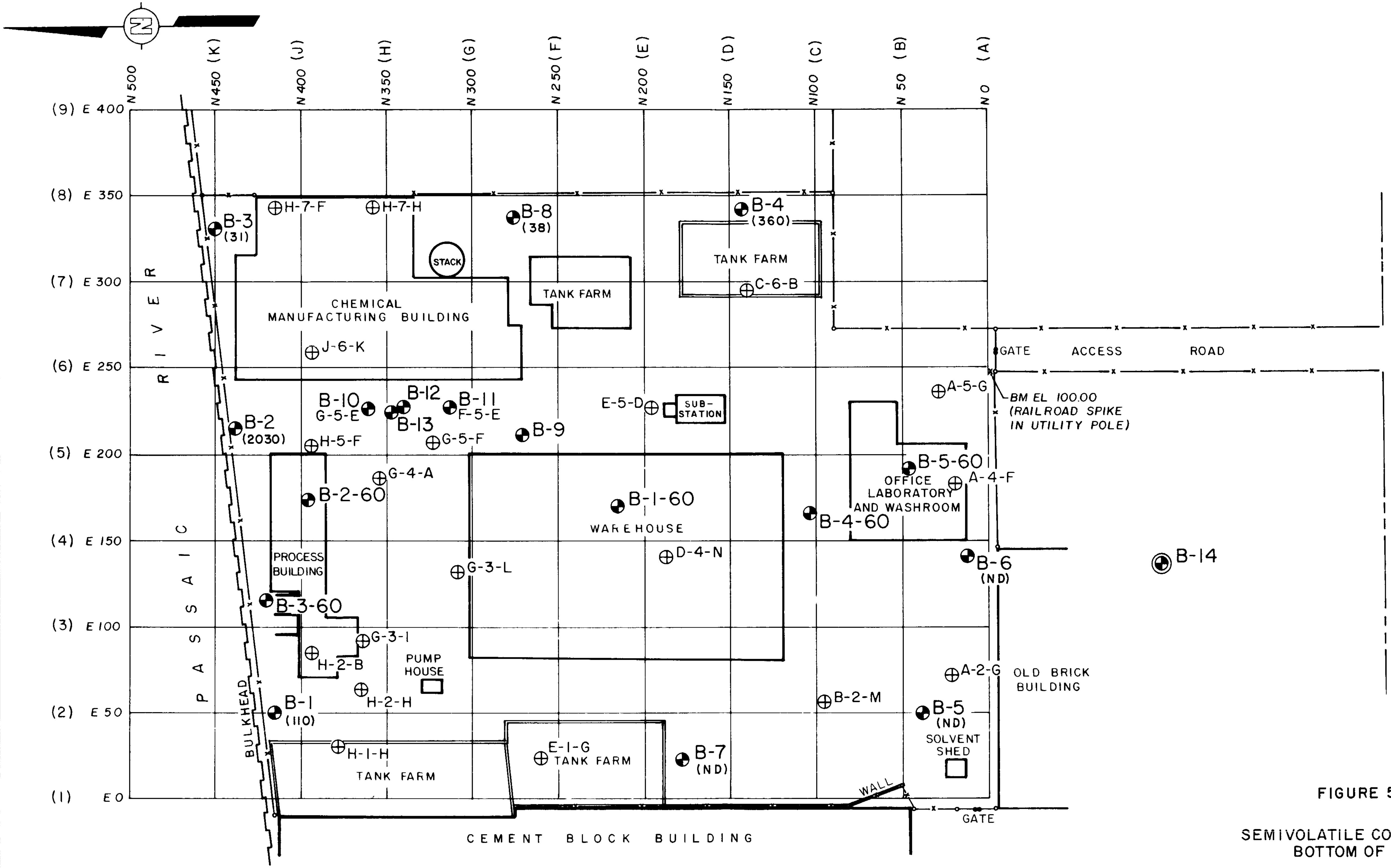
DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

100% 15B	DRAWN BY	RW/DAW 1-29-85	CHECKED BY	JTO 2-15-85	DRAWING NUMBER	846248-B35
ORG. 15B			APPROVED BY	OGE 2-15-85		

65360

"Do Not Scale This Drawing"



LEGEND:

B-7 ● BORING LOCATION AND NUMBER

E-5-D ⊕ NEAR SURFACE SOIL SAMPLE AND NUMBER

(110) SEMIVOLATILE COMPOUND CONCENTRATIONS (CONCENTRATIONS ARE ÷1000 μG/KG)

NOTES:

1. SEMIVOLATILE COMPOUNDS ARE:
   2,4,5-TRICHLOROPHENOL
   2,4,6-TRICHLOROPHENOL
   2,4-DICHLOROPHENOL
   HEXACHLOROBENZENE
2. RESULTS ARE FROM ANALYSES OF 109 SERIES SAMPLES, SEE FIGURE 5.5.2-1.

SCALE

0 60 120 FEET

FIGURE 5.5.2.2-3

SEMIVOLATILE COMPOUNDS IN SOILS
BOTTOM OF FILL LAYER

PREPARED FOR

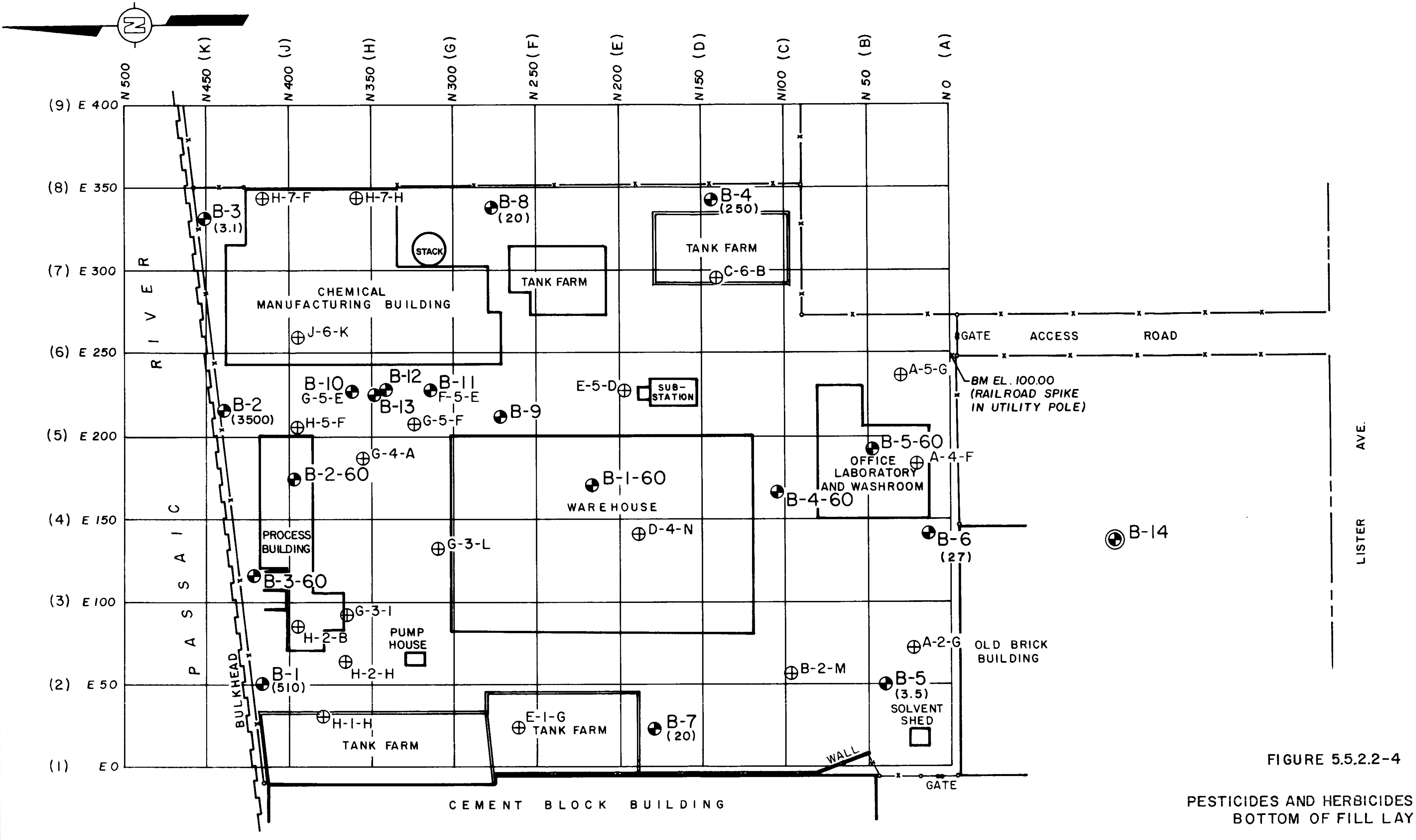
DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

100% 9B ORG. 9B	DRAWN BY	RW 1-29-85	CHECKED BY APPROVED BY	JTO 2-15-85 DGE 2-15-85	DRAWING NUMBER 846248-B36

65360

Do Not Scale This Drawing



LEGEND:

B-7 ●	BORING LOCATION AND NUMBER
E-5-D ⊕	NEAR SURFACE SOIL SAMPLE AND NUMBER
(3500)	PESTICIDES AND HERBICIDES CONCENTRATIONS (CONCENTRATIONS ARE ÷ 1000 μG/KG)

NOTES:

1. SEMIVOLATILE COMPOUNDS ARE:
   - 2,4,5-TRICHLOROPHENOL
   - 2,4,6-TRICHLOROPHENOL
   - 2,4-DICHLOROPHENOL
   - HEXACHLOROBENZENE
2. RESULTS ARE FROM ANALYSES OF 109 SERIES SAMPLES, SEE FIGURE 5.5.2-1.

SCALE

0 60 120 FEET

FIGURE 5.5.2.2-4

PESTICIDES AND HERBICIDES IN SOILS
BOTTOM OF FILL LAYER

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

100% IOB	DRAWN BY	RW/DAW	CHECKED BY	JJO	DRAWING NUMBER 846248-B37
ORG. IOB		1-29-85	APPROVED BY	2-15-85	

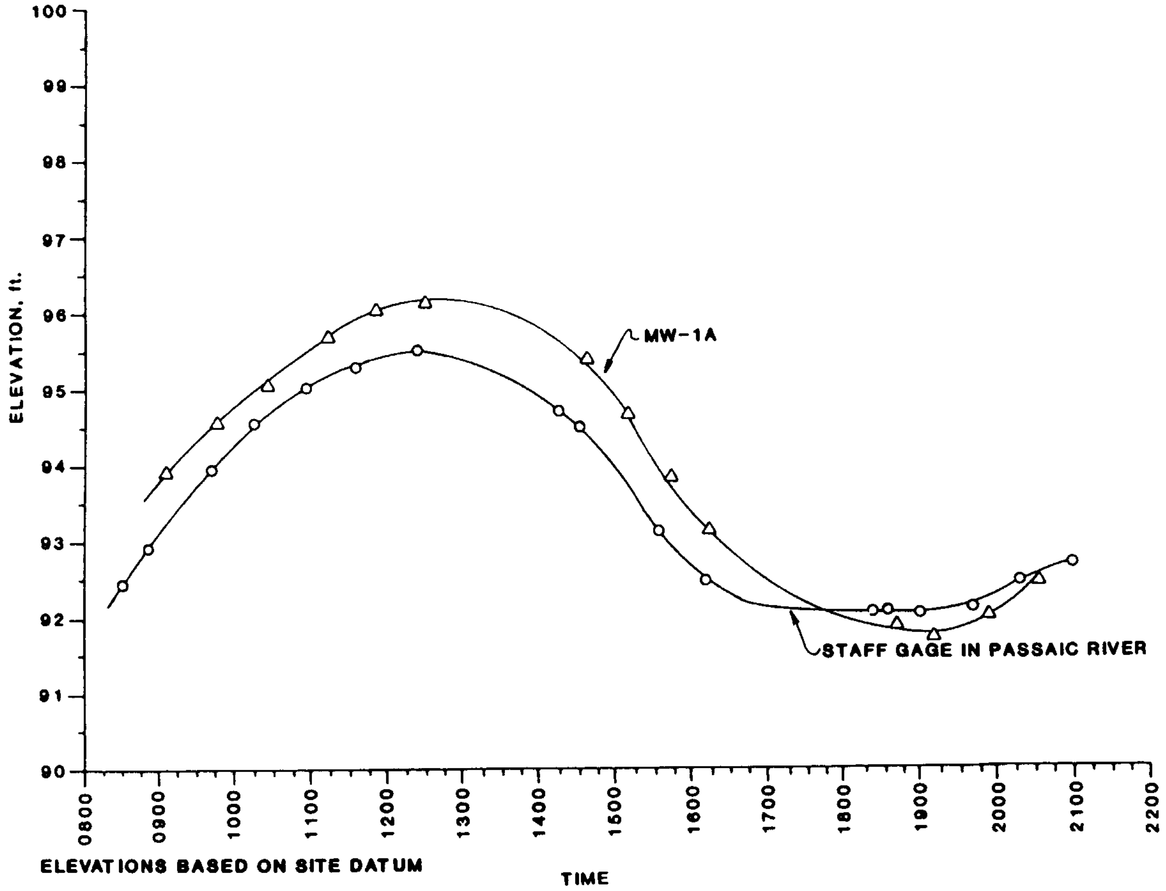
65160

DRAWING NUMBER 846248-A27

CHECKED BY

APPROVED BY

DRAWN BY D.WEICK 1-29-85



ELEVATIONS BASED ON SITE DATUM

OCTOBER 15, 1984

STAFF GAGE

TIME	RIVER ELEV.
8:30	92.46
8:50	92.91
9:40	93.96
10:14	94.58
10:55	95.05
11:35	95.31
12:24	95.51
14:15	94.66
14:29	94.44
15:36	93.14
16:10	92.44
18:18	92.06
18:31	92.06
19:01	92.01
19:43	92.16
20:23	92.56
21:00	92.66

MW-1A

TIME	WATER ELEV.
9:06	93.93
9:45	94.55
10:25	95.13
11:08	95.68
11:50	96.02
12:30	96.15
14:35	95.39
15:09	94.65
15:41	93.84
16:14	93.18
18:36	91.89
19:09	91.77
19:49	92.04
20:31	92.50

FIGURE 5.6.1-1

GROUND WATER ELEVATION VERSUS TIDAL FLUCTUATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

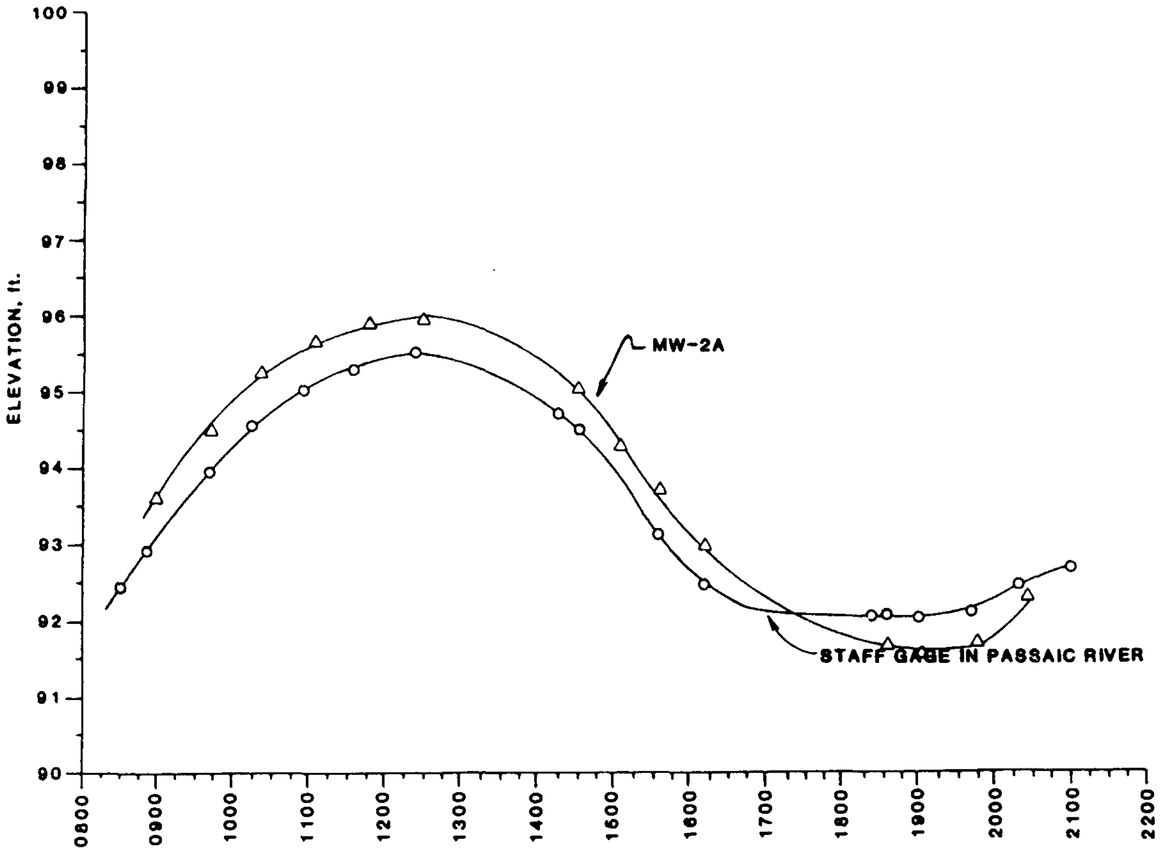
Do Not Scale This Drawing

DRAWING NUMBER 846248-A28

CHECKED BY

APPROVED BY

DRAWN BY D. Weick 1-29-85



ELEVATIONS BASED ON SITE DATUM

OCTOBER 15, 1984

STAFF GAGE

TIME	RIVER ELEV.
8:30	92.46
8:50	92.91
9:40	93.96
10:14	94.58
10:55	95.05
11:35	95.31
12:24	95.51
14:15	94.66
14:29	94.44
15:36	93.14
16:10	92.44
18:18	92.06
18:31	92.06
19:01	92.01
19:43	92.16
20:23	92.56
21:00	92.66

MW-2A

TIME	WATER ELEV.
9:00	93.63
9:42	94.53
10:21	95.26
11:04	95.64
11:45	95.91
12:28	95.94
14:31	95.01
15:06	94.28
15:38	93.68
16:12	92.99
18:34	91.65
19:03	91.55
19:44	91.71
20:26	92.27

FIGURE 5.6.1-2

GROUND WATER ELEVATION
VERSUS TIDAL FLUCTUATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

IT ... Creating a Safer Tomorrow

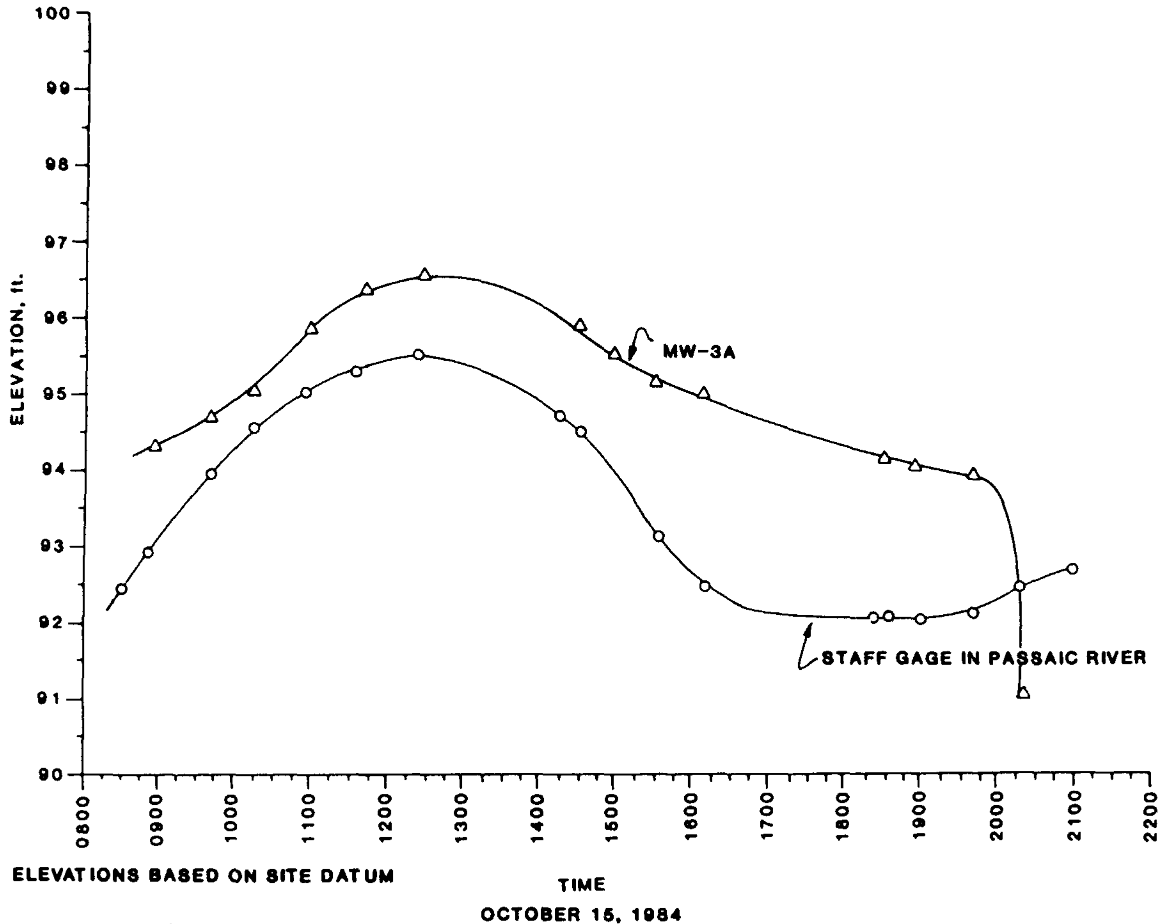
Do Not Scale This Drawing

DRAWING NUMBER 846248-A29

CHECKED BY

APPROVED BY

DRAWN BY D.Weick 1-29-85



ELEVATIONS BASED ON SITE DATUM

STAFF GAGE	
TIME	RIVER ELEV.
8:30	92.46
8:50	92.91
9:40	93.96
10:14	94.58
10:55	95.05
11:35	95.31
12:24	95.51
14:15	94.66
14:29	94.44
15:36	93.14
16:10	92.44
18:18	92.06
18:31	92.06
19:01	92.01
19:43	92.16
20:23	92.56
21:00	92.66

MW-3A	
TIME	WATER ELEV.
8:55	94.30
9:37	94.70
10:15	95.03
11:00	95.83
11:40	96.39
12:25	96.55
14:28	95.91
15:01	95.52
15:34	95.17
16:08	95.01
18:30	94.18
18:59	94.07
19:39	93.94
20:17	91.05

FIGURE 5.6.1-3

GROUND WATER ELEVATION VERSUS TIDAL FLUCTUATION

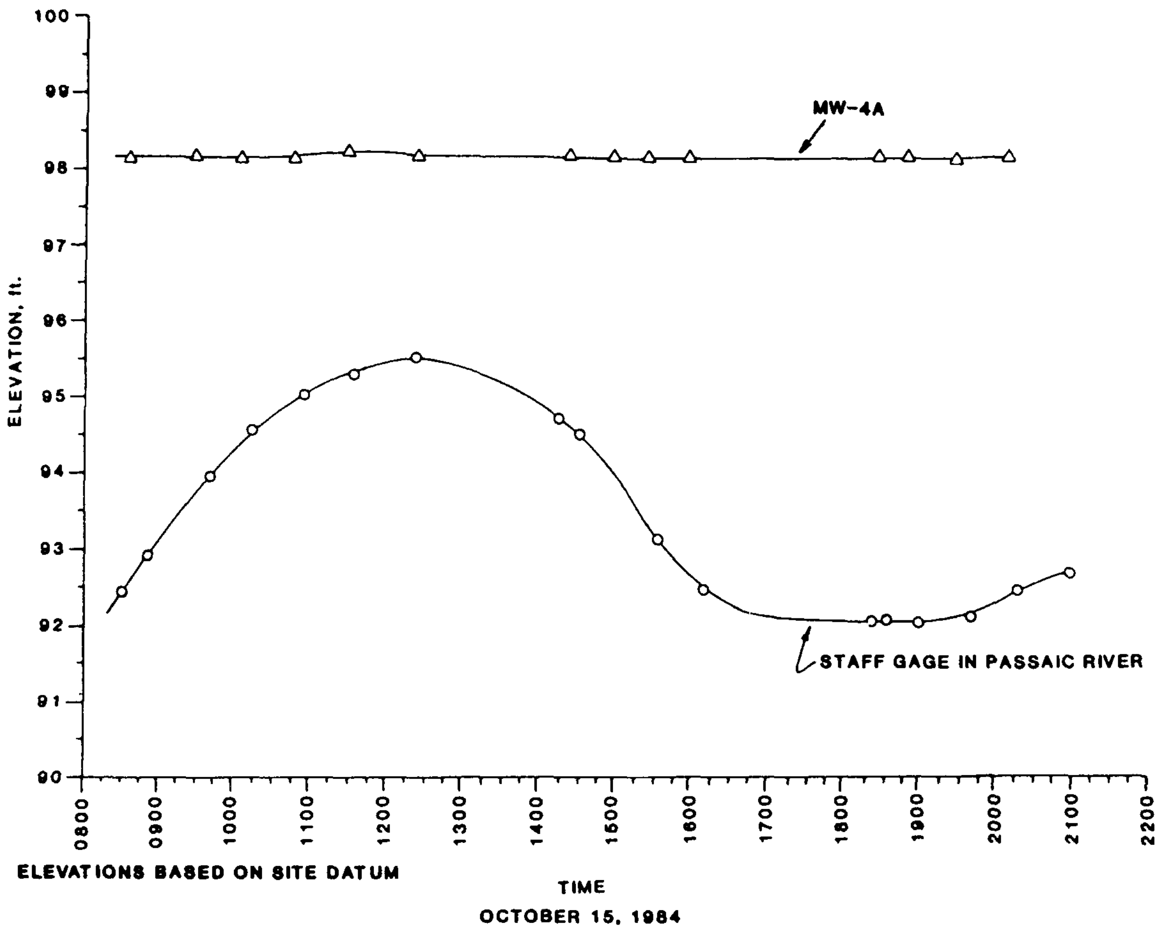
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

Do Not Scale This Drawing

IT ... Creating a Safer Tomorrow



STAFF GAGE

TIME	RIVER ELEV.
8:30	92.46
8:50	92.91
9:40	93.96
10:14	94.58
10:55	95.05
11:35	95.31
12:24	95.51
14:15	94.66
14:29	94.44
15:36	93.14
16:10	92.44
18:18	92.06
18:31	92.06
19:01	92.01
19:43	92.16
20:23	92.56
21:00	92.66

MW-4A

TIME	WATER ELEV.
8:35	98.14
9:30	98.17
10:07	98.15
10:45	98.15
11:26	98.21
12:20	98.17
14:21	98.17
14:56	98.16
15:27	98.15
16:01	98.16
18:25	98.13
18:50	98.13
19:25	98.12
20:10	98.12

FIGURE 5.6.1-4

GROUND WATER ELEVATION VERSUS TIDAL FLUCTUATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

. . . Creating a Safer Tomorrow

DRAWING NUMBER 846248-A30
CHECKED BY
APPROVED BY
DRAWN BY D. Weick 1-29-85

65360

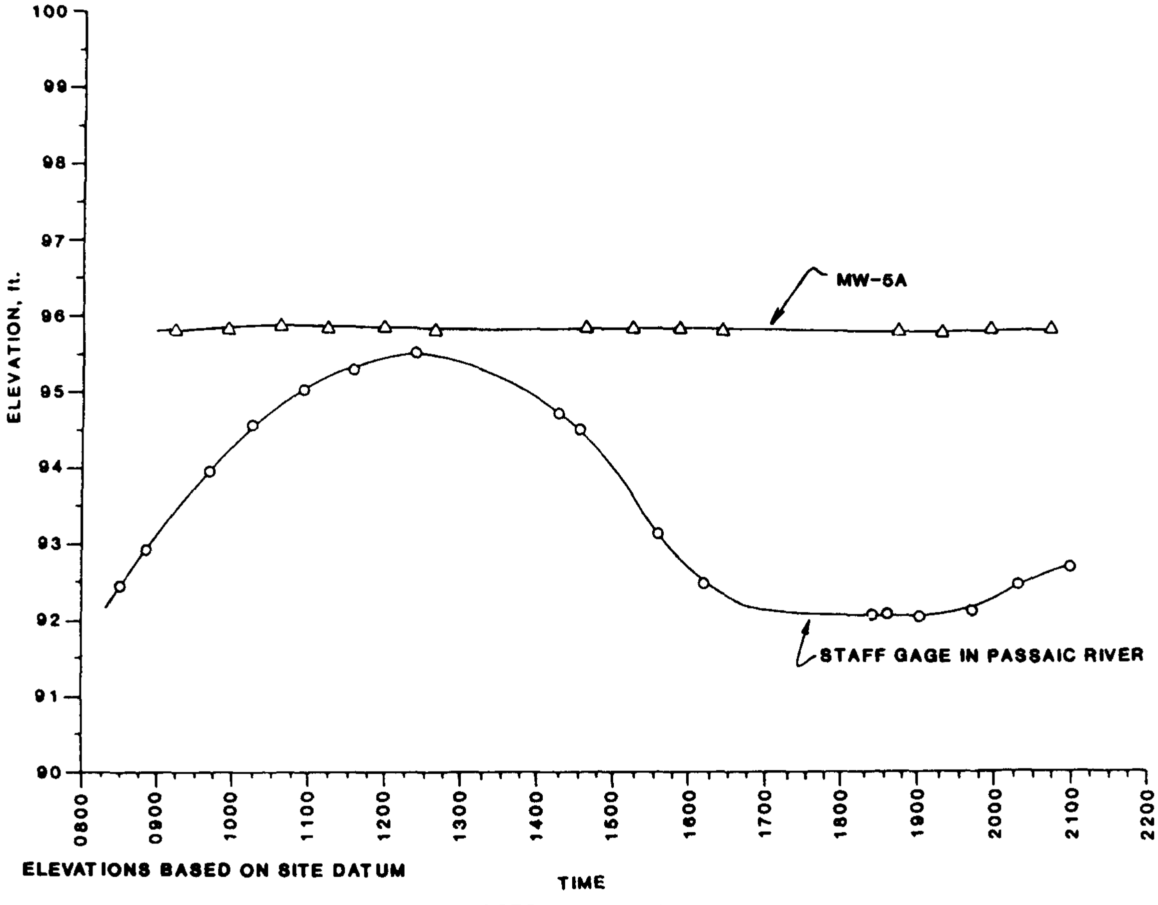
Do Not Scale This Drawing

DRAWING NUMBER 846248-A31

CHECKED BY

APPROVED BY

DRAWN BY D. Weick 1-29-85



ELEVATIONS BASED ON SITE DATUM

STAFF GAGE

TIME	RIVER ELEV.
8:30	92.46
8:50	92.91
9:40	93.96
10:14	94.58
10:55	95.05
11:35	95.31
12:24	95.51
14:15	94.66
14:29	94.44
15:36	93.14
16:10	92.44
18:18	92.06
18:31	92.06
19:01	92.01
19:43	92.16
20:23	92.56
21:00	92.66

MW-6A

TIME	WATER ELEV.
9:16	95.80
9:55	95.81
10:35	95.85
11:15	95.81
12:01	95.81
12:37	95.80
14:42	95.82
15:15	95.83
15:50	95.84
16:25	95.82
18:42	95.80
19:14	95.81
19:58	95.82
20:44	95.82

FIGURE 5.6.1-5

GROUND WATER ELEVATION
VERSUS TIDAL FLUCTUATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

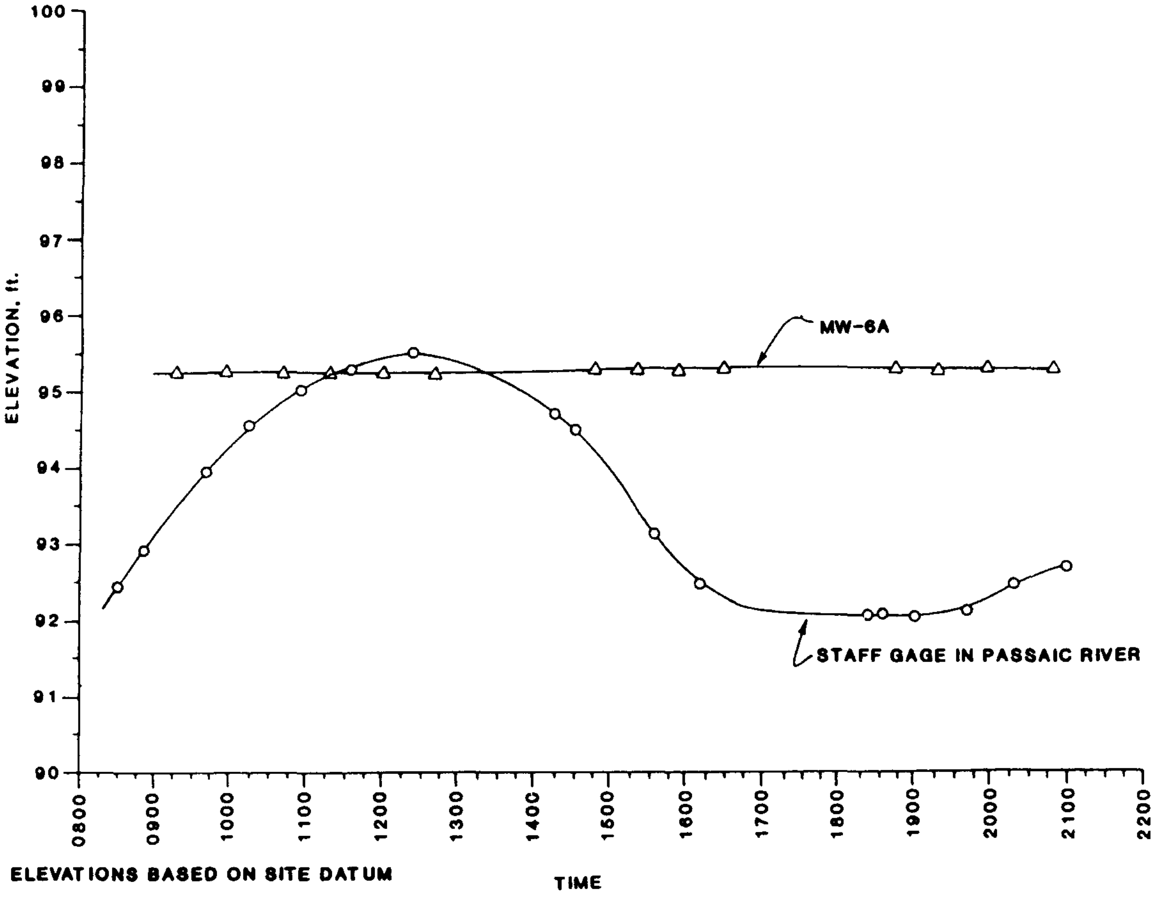
Do Not Scale This Drawing

DRAWING NUMBER 846248-A32

CHECKED BY

APPROVED BY

DRAWN BY D. Weick 1-29-85



ELEVATIONS BASED ON SITE DATUM

OCTOBER 15, 1984

STAFF GAGE

TIME	RIVER ELEV.
8:30	92.46
8:50	92.91
9:40	93.96
10:14	94.58
10:55	95.05
11:35	95.31
12:24	95.51
14:15	94.66
14:29	94.44
15:36	93.14
16:10	92.44
18:18	92.06
18:31	92.06
19:01	92.01
19:43	92.16
20:23	92.56
21:00	92.66

MW-6A

TIME	WATER ELEV.
9:20	95.28
9:58	95.27
10:38	95.25
11:19	95.24
12:05	95.24
12:40	95.23
14:46	95.28
15:18	95.30
15:53	95.28
16:28	95.30
18:45	95.28
19:17	95.28
20:01	95.28
20:48	95.27

FIGURE 5.6.1-6

GROUND WATER ELEVATION
VERSUS TIDAL FLUCTUATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ... Creating a Safer Tomorrow

65360

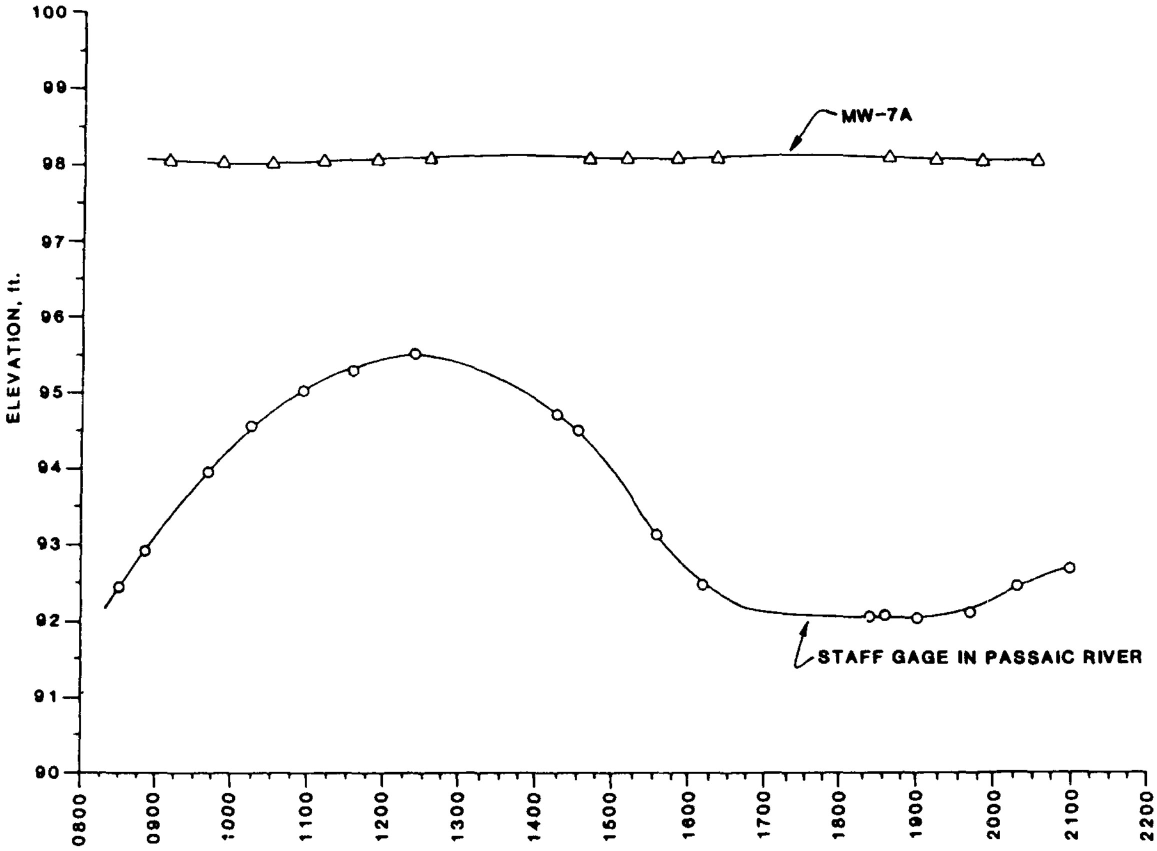
Do Not Scale This Drawing

DRAWING NUMBER 846248-A33

CHECKED BY

APPROVED BY

DRAWN BY D.Weick 1-29-85



ELEVATIONS BASED ON SITE DATUM

OCTOBER 15, 1984

STAFF GAGE

TIME	RIVER ELEV
8:30	92.46
8:50	92.91
9:40	93.96
10:14	94.58
10:55	95.05
11:35	95.31
12:24	95.51
14:15	94.66
14:29	94.44
15:36	93.14
16:10	92.44
18:18	92.06
18:31	92.06
19:01	92.01
19:43	92.16
20:23	92.56
21:00	92.66

MW-7A

TIME	WATER ELEV.
9:11	98.07
9:51	98.05
10:30	98.04
11:12	98.06
11:55	98.07
12:35	98.09
14:39	98.09
15:12	98.07
15:47	98.09
16:21	98.09
18:40	98.07
19:14	98.04
19:54	98.04
20:37	98.05

FIGURE 5.6.1-7

GROUND WATER ELEVATION VERSUS TIDAL FLUCTUATION

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

IT ... Creating a Safer Tomorrow

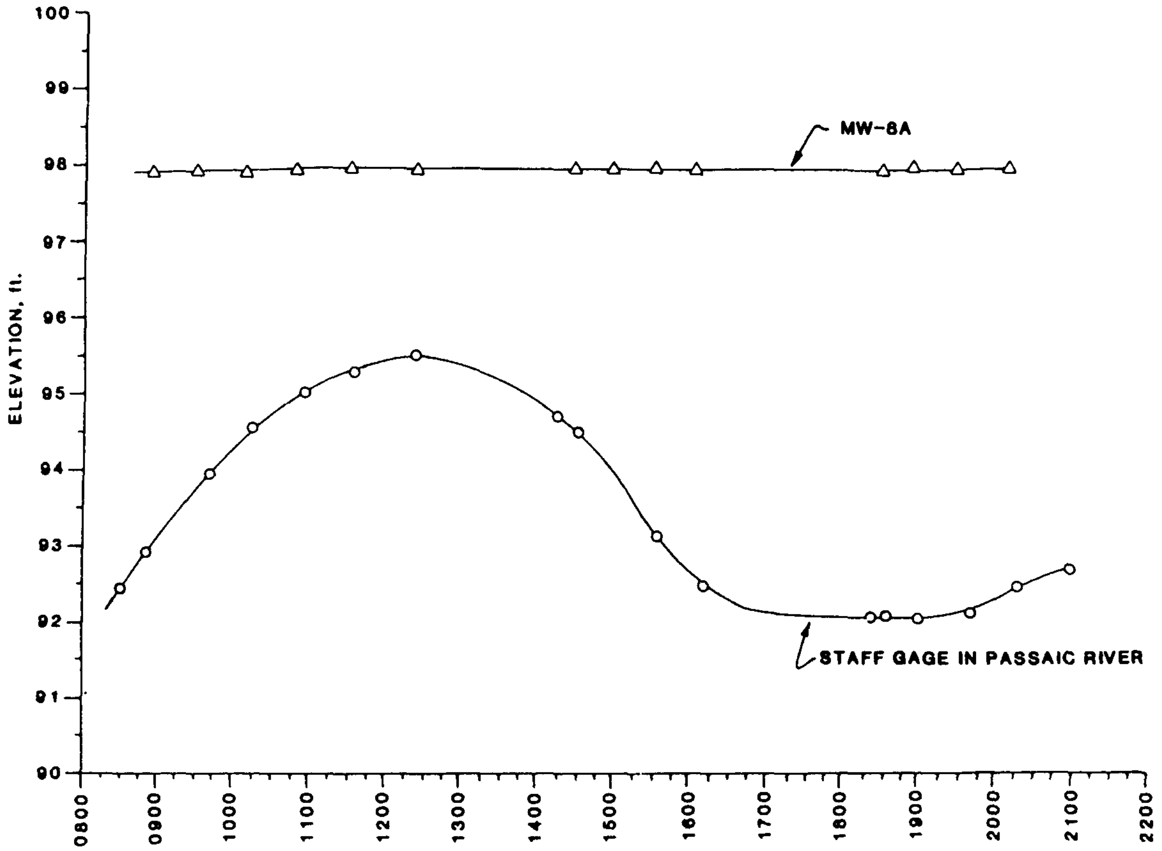
Do Not Scale This Drawing

DRAWING NUMBER 846248-A34

CHECKED BY

APPROVED BY

DRAWN BY D Weick 1-29-85



ELEVATIONS BASED ON SITE DATUM

TIME
OCTOBER 15, 1984

STAFF GAGE

TIME	RIVER ELEV
8:30	92.46
8:50	92.91
9:40	93.96
10:14	94.58
10:55	95.05
11:35	95.31
12:24	95.51
14:15	94.66
14:29	94.44
15:36	93.14
16:10	92.44
18:18	92.06
18:31	92.06
19:01	92.01
19:43	92.16
20:23	92.56
21:00	92.66

MW-8A

TIME	WATER ELEV.
8:48	97.93
9:33	97.95
10:10	97.93
10:50	97.95
11:31	97.98
12:22	97.96
14:25	97.96
14:58	97.96
15:30	97.97
16:04	97.95
18:27	97.95
18:53	97.96
19:33	97.94
20:13	97.95

FIGURE 5.6.1-8

GROUND WATER ELEVATION VERSUS TIDAL FLUCTUATION

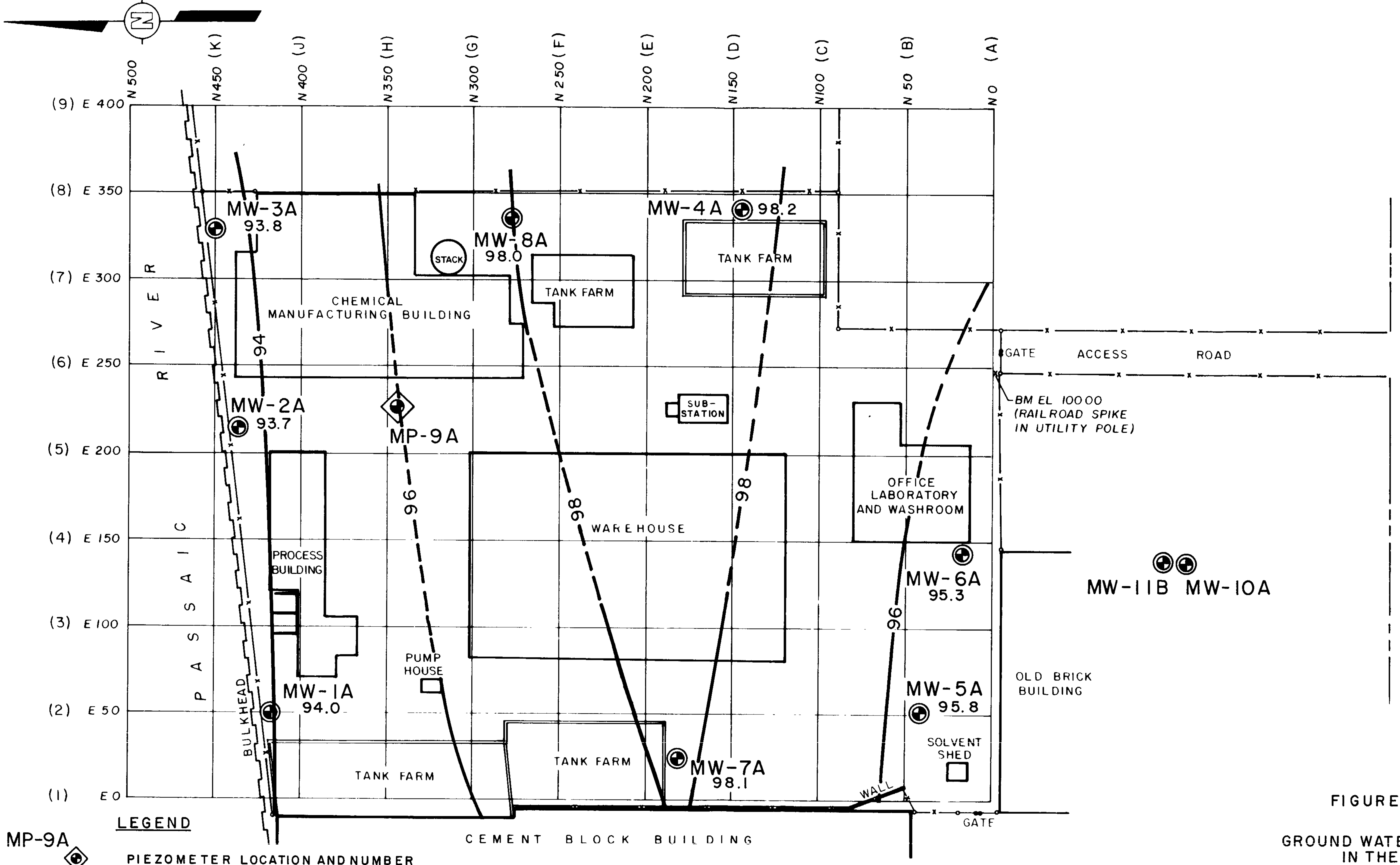
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

65360

IT ... Creating a Safer Tomorrow

"Do Not Scale This Drawing"



LEGEND

MP-9A	PIEZOMETER LOCATION AND NUMBER
MW-1A	SHALLOW DEPTH MONITORING WELL
MW-11B	INTERMEDIATE DEPTH MONITORING WELL
94.0	GROUND WATER LEVEL (10-15-84)
—94—	GROUND WATER CONTOUR (10-15-84)

NOTE:
ELEVATIONS SHOWN ARE BASED ON SITE DATUM

SCALE
0 60 120 FEET

FIGURE 5.6.1-9

GROUND WATER CONTOURS IN THE FILL

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

Do Not Scale This Drawing

65360

100% 4B	DRAWN BY	RW	1-29-85	CHECKED BY	J/O	2-15-85	DRAWING NUMBER 846248-B21
ORG 4B				APPROVED BY	DGE	2-15-85	

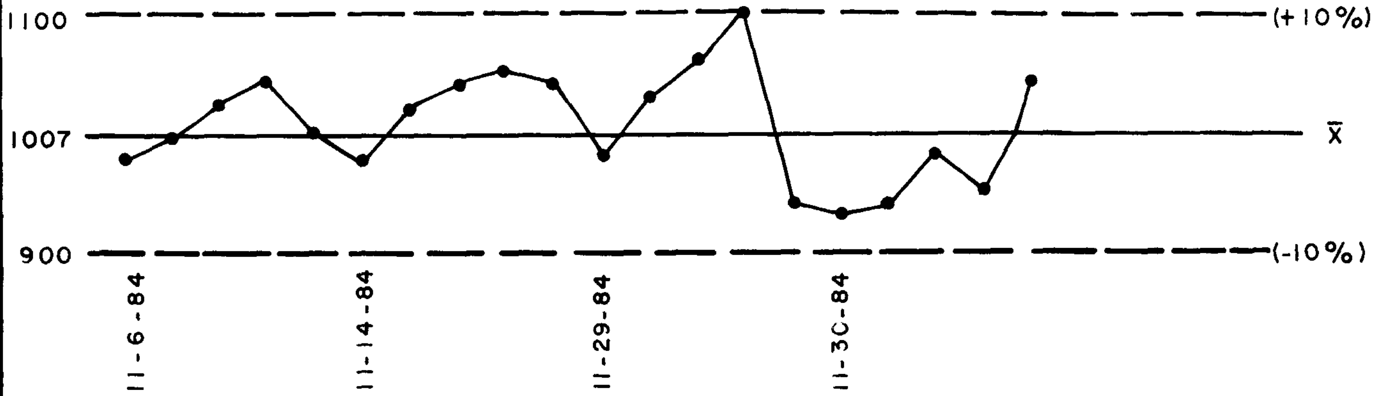
DRAWING NUMBER 846248-A52

CHECKED BY

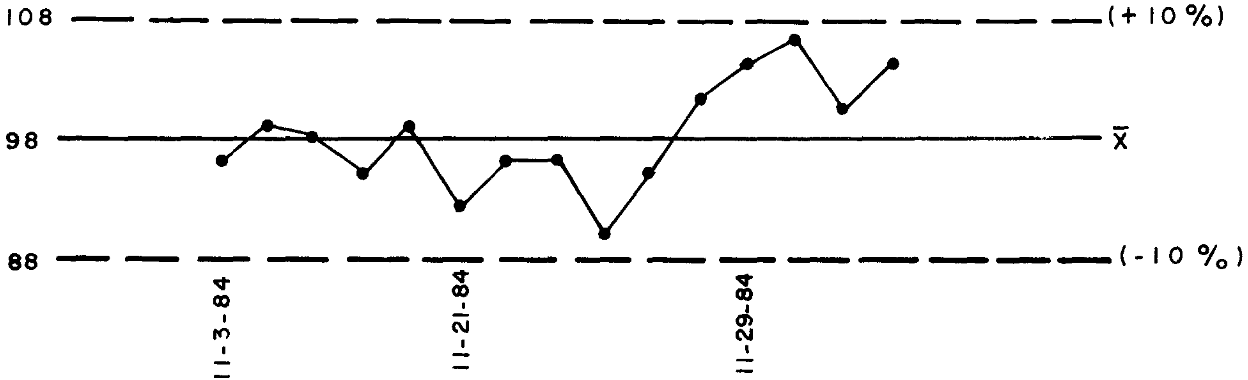
APPROVED BY

J. LOGRECO 2-14-85

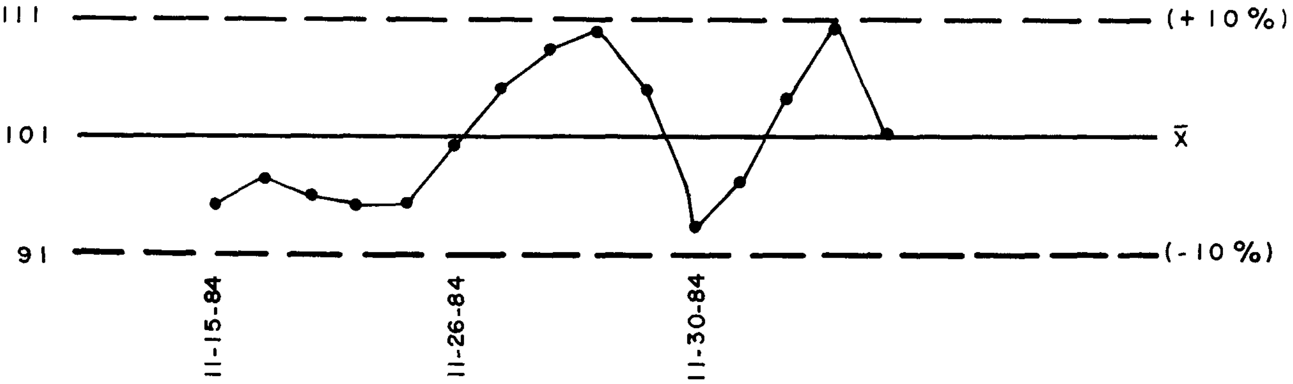
DRAWN BY



ZINC RF CONTROL CHART



LEAD RF CONTROL CHART



NICKEL RF CONTROL CHART

FIGURE 5.12.2.2-1

EXAMPLE STANDARD CONTROL CHARTS FOR METALS

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

NOTE:

RESPONSE FACTOR (RF) = $\frac{\text{Peak height (mm)}}{\text{Conc. (mg/l)}}$

IT ...Creating a Safer Tomorrow

Do Not Scale This Drawing

65360

6.0

6.0 SITE CHARACTERIZATION

6.1 AMBIENT AIR

The highest concentrations in the ambient air samples of total suspended particulates matter (TSP) and inhalable particulate matter (IPM) both occurred on September 25, 1984. The TSP concentration on that date was 254 milligram per cubic meter (mg/m^3) which exceeds the secondary 24-hour National Ambient Air Quality Standard (NAAQS) of 150 mg/m^3 for TSP, but is less than the 24-hour primary standard of 260 mg/m^3. The IPM concentration on September 25 was 196 mg/m^3 which is greater than the 150 mg/m^3 lower range for the proposed 24-hour IPM NAAQS.

The highest total metals concentration was 2.6 mg/m^3 and occurred on October 4, 1984. The relative concentrations of the various metals are consistent with those measured in Newark during the Airborne Toxic Elements and Organic Substances (ATEOS) studies. The most abundant metals were iron, lead, manganese and zinc, again paralleling the results of the ATEOS studies.

Dioxin was not detected on any of the days on which maximum concentrations of TSP, IPM, metals, VOC's, pesticides or PNA were measured. Dioxin was detected on September 10 and 24, at respective concentrations of 86 and 286 picograms per cubic meter (pg/m^3).

The highest total VOC concentration was 182 mg/m^3 which was measured on September 25. Major constituents were xylene, toluene and ethyl benzene, all aromatic hydrocarbons commonly emitted from petroleum refineries and plants manufacturing coatings and solvents; they are also constituents of aviation fuel. Other major constituents were trichloroethene and tetrachloroethene which are solvents widely used for dry cleaning and degreasing.

The highest measured concentration for asbestos was 0.009 fibers/cm^3, which was observed on September 10. The OSHA standard for asbestos is currently under review, but this concentration is well below the range of the proposed standard.

The maximum observed concentration of pesticides was 75 nanograms per cubic meter (ng/m^3) occurred on September 8. This was primarily due to 4-methoxy benzene sulfonyl chloride. This was also the most prevalent pesticide measured in all 10 samples analyzed.

The maximum concentration of polynuclear aromatics (PNA) was 37 mg/m^3 measured on October 4. Forty-two percent of this concentration was due to perylene. Perylene was found to be the most prevalent PNA in all 10 samples analyzed.

6.2 WASTE CHARACTERIZATION

As a result of the site investigation effort, a number of contaminants have been identified in the on-site wastes. These are described in the following paragraphs.

All of the 570 drums on site, which are currently stored in the two process buildings, have been sampled and tested for hazardous categorization. Drum material includes liquids, pastes, sludges, and a variety of solids. A total of 476 of the drums were determined to be full, with the remaining 94 drums partially full. The estimated quantity of material stored in the drums is 245,000 pounds, with 76,000 pounds characterized as solids or sludges and 169,000 pounds as liquid. The drummed material taken from a common source (reactor, sump, tank, etc.) had common lot or group markings. A total of 50 different lot or group designations were discovered and documented during the sampling program.

Twenty-two drums representing 21 different lots (which comprised 499 of the 570 drums stored) were analyzed for dioxin. Fifteen of the analyses were positive, i.e., greater than one ppb, and seven produced nondetected results. The most significant dioxin contamination was detected in a drum containing solids and sludge labeled lot "Pit 3" (36 drums were included in this lot) at 8,750 ppb and from a drum containing yellow crystalline powder labeled lot "CQ" (11 drums were included in this lot) at 12,200 ppb. A weighted average of the lots determined to have positive dioxin concentrations indicates an estimated 230,000 pounds of material containing 940 ppb dioxin, or 98 grams. The 47 drums of "Pit 3" and "CQ" material contribute 93 grams of the total estimated quantity of dioxin.

In addition to the 570 drums already on the site, 125 drums of various waste were created during the site investigation undertaken by Diamond Shamrock. All of this material is currently stored in labeled drums in the warehouse. The location of each numbered drum is shown in Figure 6.2-1. The material stored includes soil, cement, and debris from drilling operations; water collected from the bailing of monitoring wells while sampling ground water; trash including bottles, polyethylene sheeting, boxes and paper; disposable items such as gloves, towels, and tyvek suits; and water and debris collected from the cleaning of decontamination water storage tanks and the diked areas around the tanks.

Material stored in drums 600 through 663 and 691 through 697 was collected during the site sampling activities. Drums 664 through 690 contain primarily water with some debris collected from inside the dike areas at the two major tank farms, and from the inside of Tank No. 2. Drums 698 through 715 were collected during the general site cleanup and background drilling operations on the Sherwin-Williams property. Drums 716 through 724 were filled during the final on-site cleanup activities.

In addition to the drums discussed above, there are approximately 400 to 500 drums stored in the warehouse which contain materials generated by the NJDEP and EPA during their area investigations and by Diamond Shamrock during site stabilization. These drums contain water from personnel decontamination, tyvek suits and other disposable personnnel protective equipment and debris and soil picked up during area remedial activities.

The only other major source of waste on the site is the material stored in tanks and vessels. Although all of the tanks, except Tank No. 5 which contained fuel oil, were empty when inspected, bulk samples of "heels" or residual solids were collected from 112 units. The estimated maximum quantity of waste material currently remaining in vessels is 45,000 pounds--36,000 pounds of solids and 9,000 pounds of liquids.

Tanks 1, 2, 3, and 4 were cleaned for use as decontamination water collection tanks. During the course of this site investigation program, an estimated 35,000 gallons of decontamination water was generated, and is currently stored in Tanks 1 and 2 pending determination of treatment and discharge requirements.

6.3 FACILITIES

The sampling program for facilities on the site confirmed the presence of dioxin both inside and outside all the on-site structures, as discussed in the following paragraphs.

Dioxin contamination appears to be greatest in the process building, where all 29 samples collected yielded positive dioxin levels as high as 41,600 ng/m^2 and 1,500 ppb. The chemical manufacturing building with 26 out of 28 samples producing positive results also has significant levels of contamination. Contamination in the warehouse is significantly less than that determined in the process and chemical manufacturing buildings with some high levels detected in the concrete slab floor and in the dust collected from flat elevated surfaces inside the building. The laboratory/office building is essentially the cleanest of the four major buildings with the highest levels detected in the floor of the basket room at 69.3 ppb and on a laboratory hood at 14,000 ng/m^2. The level detected in the laboratory hood is judged to be an isolated event because of the function of the hood. The stack and solvent shed had low levels of contamination both inside and outside of these structures. Contamination in the pump house, at 5.3 and 50.0 ppb, was notably higher.

In general, dioxin contamination is greater on the interior surfaces of all the buildings than on the exterior surfaces. Roofs have the lowest dioxin concentrations, while floors usually have the greatest. The laboratory/office building exterior walls had no positive dioxin results above ground level.

Due to the biased sample location strategy used, extrapolation of the results to quantify the total amount of dioxin in the structures is not feasible. However, an estimate of the volume of various types of materials in each of the major buildings that is potentially contaminated with dioxin has been made and is shown in Table 6.3-1. The total volume of material from all four major buildings is estimated to be 3,180 cubic yards.

Associated with the process and chemical manufacturing buildings are a number of sumps and the industrial sewer system.

All of the sumps inspected during the site investigation had been previously cleaned or emptied to some degree. However, enough residual material remained in each to enable the collection of bulk samples. A total of eight sump samples were taken, three from within the chemical manufacturing building, two outside the chemical manufacturing building, and three just outside the process building. Four sewer samples were collected from manholes accessible on the site. Positive dioxin results were obtained for all 12 samples. The sumps generally had higher levels of dioxin contamination than sewers, especially those near the process building, where levels ranged from 105 to 9,160 ppb; sewer results ranged from 19.5 to 4,040 ppb. Contamination in the sewer system appears to decrease from the process and chemical manufacturing buildings toward the laboratory/office building.

6.4 SOILS AND GEOLOGY

6.4.1 Site Geologic Model

The site facility at is built on a previously occupied industrial property located on a filled portion of a lowland tidal marsh known as the Hackensack Meadows (Subsection 3.2.2). The general geologic profile consists of 6 to 15 feet of fill, 3 to 11 feet of silt consisting of an upper highly organic layer and lower layer with thin lenses of sand and clay, 70 to 80 feet of alternating layers of glacio-fluvial sands and gravels, and the shale and sandstone of the Brunswick Formation. Figure 6.4.1-1 shows a generalized north-south schematic cross section of the site.

Ground surface at the site exhibits a variation of about three feet and is generally flat. No features of the natural ground surface are visible at the present time. The surface has been graded, either gravelled or paved, and is currently covered with a geofabric.

6.4.2 Fill

The fill portion of the stratigraphic column beneath the site is generally loose to medium dense, gray to black, sand and gravel fill of manmade origin. It contains bricks, wood fragments, glass, porcelain, organic material, ashes and cinders. Occasional oily material and railroad ballast are also present. It is a fairly uniformly mixed material and exhibits no distinguishing changes in composition across the site.

The thickness of the fill ranges from eight feet along the southern property boundary to 15 feet in the northwest corner of the property. Along the western boundary of the site, the old river channel is fairly well defined. The fill is approximately eight feet thick up to the point where the old river channel is encountered north of Boring B-7. In the central portion of the site, the edge of the old channel is defined just north of Boring B-11. The fill has a fairly uniform thickness of eight feet to a point just north of Boring B-11 and gradually increases in thickness in the direction of the bulkhead at the northern site boundary. It is 15 feet in thickness at Boring B-2. Along the eastern boundary of the site, the old river channel has not significantly intruded into the property. At the southeastern corner of the site, the fill is six feet in thickness. The fill increases only slightly to a thickness of eight feet at the bulkhead in the northeastern corner of the site.

Subsection 5.5.2.1 describes the dioxin levels detected in the fill layer resulting from the analysis of near-surface soil samples and shallow depth boring soil samples. The samples obtained in the fill were analyzed for dioxin in increments of depth from zero to 6, 6 to 12, and 12 to 24 inches. Soil samples obtained from the borings at depths greater than 24 inches were archived for possible future analysis with the exception of several samples (109's) obtained immediately above the silt layer.

For the zero- to 6-inch depth, dioxin concentrations varied from 0.39 ppb to 9,050 ppb. For 6- to 12-inch depths, the dioxin concentration varied from 1.2 ppb to 3,690 ppb. The analysis of samples obtained in the 12- to 24-inch depth interval resulted in concentrations ranging from 0.92 ppb to 19,500 ppb. Table 6.4.2-1 summarizes dioxin concentration ranges for the three depth intervals. All samples to the 24-inch depth analyzed for dioxin had positive results.

In general there is some attenuation of dioxin concentration to a depth of 24 inches; however, the data do not indicate a clear trend.

Eight boring soil samples from immediately above the silt layer (109's) were analyzed for dioxin. The positive results ranged from 0.36 ppb to 71.8 ppb, with one result reported as Not Detected. The distribution of results was: 1 result Not Detected; 3 results less than 3 ppb; 1 result in the range of 3 to 10 ppb; 2 results in the range of 10 to 50 ppb; and 1 result greater than 50 ppb (71.8 ppb). These results indicate that there is significant attenuation of dioxin concentration with depth. As an example, for the Boring 4, the dioxin concentrations were: zero to 6-inch depth, 130 ppb; 6- to 12-inch depth, 784 ppb; 12- to 24-inch depth, 247 ppb; immediately above the silt layer (depth of sample 6.5 to 8.0 feet), 71.8 ppb.

The priority pollutant analyses performed on fill layer samples are reported in Subsections 5.5.2.1 and 5.5.2.2. The analyses indicate that many of the priority pollutants have been identified in significant concentration in the site soils. However, the concentrations do not indicate a clear attenuation with depth. Referring to Subsection 5.9, it appears that the site cannot be clearly identified as the source of priority pollutant contamination. The comparison of site data to background data is not conclusive, because the data base is insufficient; however, it appears that many of the contaminants are widely distributed in the area surrounding the site.

6.4.3 Silt

The silt layer beneath the site consists of two units--an upper, highly organic peat/silt layer (referred to locally as "meadowmat") and a lower silt bed with interlayered clay and sand lenses with a small amount of organic material. These two units were identified in all borings advanced on site south of Boring B-11 and in Boring B-3. The observed thickness of the organic layer ranged from less than one foot to three feet across the site with no identifiable trends in deposition. The organic silt layer is composed of decayed grasses rooted in organic material produced from earlier growth. It has decayed to the present deposit of fibrous, highly organic peat with intermingled silt and humus.

The lowermost layer of the silt deposit extends across the site and is probably the depositional result of tidal flat processes. It is a fine-grained sediment deposited in a low-energy environment. Intermingled in this layer are some roots and thin sand and gravel layers. The contact between the two silt units and the underlying glacio-fluvial sands is generally gradational. The thickness of this lower unit varies from three to eight feet, with the thickest deposit detected in the off-site (Sherwin-Williams) wells.

Initially, seven samples in the silt layer were analyzed for dioxin. Subsequently, two additional silt samples, from B-10 and B-11, were also analyzed. It was not expected that dioxin would be detected, but six of these nine samples indicated results above the method detection level, ranging from 0.49 to 11.8 ppb dioxin. Because of these positive results, five additional silt layer samples were selected from the archived Shelby tubes and analyzed. The five archive samples resulted in two results above detection limits. The highest dioxin result in any silt sample was 11.8 ppb from Boring B-10, which is adjacent to the chemical manufacturing building. It is noted that the upper organic silt layer is not present in this area. The remaining positive values ranged from 1.2 ppb to 2.8 ppb dioxin.

Analysis for priority pollutants was not performed on silt layer samples.

6.4.4 Glacio-Fluvial Sands

The glacio-fluvial sands underlying the site are part of the Pleistocene deposition of material from glacial meltwater. The resulting sediments (silts, sands, and gravels) were sorted hydraulically prior to deposition and formed discontinuous layers across the site. The thickness of the sand unit is estimated to be approximately 80 feet, although the bedrock contact was not identified in this investigation. From published data, the sand unit tends to thicken toward the northwest, away from the site, following bedrock contours (Lovegreen, 1974).

Intermingled sand, silt, and gravel lenses were identified in all borings penetrating the sand layer, but these could not be correlated continuously across the entire property. Information gained from these borings and wells in the area suggests that the unit becomes coarser with depth.

Analyses were not performed for any compounds in this sand unit.

6.4.5 Bedrock Units

Based on a study of regional data in the site area, bedrock at the site is anticipated to be interbedded sandstone and shale of the Brunswick Formation. This unit is highly fractured and is the principal bedrock aquifer in the area. The depth to bedrock, based upon available data, should be in the range of 95 to 105 feet beneath the surface of the site. However, the borings drilled for this investigation were not drilled to sufficient depth to encounter the bedrock.

6.5 GROUND WATER HYDROLOGY

6.5.1 Site Hydrogeologic Model

The fill, the underlying glacio-fluvial sand deposit, and the bedrock of the Brunswick Formation are the significant aquifers beneath the site. A silt layer separates the fill and the glacio-fluvial sands, and ranges in thickness from 3 to 11 feet. Data from site borings indicate that this silt layer is probably continuous across the site.

The fill material on the site constitutes a "surficial aquifer" and the silt layer underlying the fill has a lower permeability, restricting the downward movement of ground water contained in the fill. Table 5.6.1-1 presents a summary of monitoring well data for the fill material. The last column of the table shows that the saturated thickness of the permeable zones in the fill ranges from about two to eight feet. The saturated thickness for monitoring wells MW-1A, 2A, and 3A is likely to range both higher and lower than the values shown in Table 5.6.1-1 because of the effect of tidal fluctuations on surficial ground water levels near the river. Although fill layer is denoted as the surface aquifer, it is very limited in extent and does not serve as a source of potable or industrial water usage.

The glacio-fluvial sand deposit underlying the silt layer is a significant water-bearing unit. The three deepest borings on site (B-1, B-3, and B-9, all drilled to 81.5 feet) indicated this unit to be at least 62 to 68 feet thick at the boring locations. The unit appears to be completely saturated. Some possible industrial usage of water from this unit is indicated in Table 3.3.2-1. It is not known whether a glacio-lacustrine clay layer separates the glacio-fluvial sand deposit and the shale or sandstone bedrock at the site as it does in many parts of the area (Nichols, 1968). The glacio-lacustrine layer could retard downward flow in the sand unit.

Bedrock is composed of Triassic sandstones and shales of the Brunswick Formation. Based on well data from nearby areas, it appears that the Brunswick Formation beneath the site is fractured. The Brunswick aquifer is the source of potable water (Table 3.3.2-1) in the surrounding area.

6.5.2 Piezometric Levels

Ground water levels in the fill are generally a few feet below the ground surface (Table 5.6.1-1). Tidal fluctuations are observable in MW-1A, 2A, and 3A, indicating that the ground water in the fill near the river is in close communication with the river. Typical ground water level data are presented in Figures 5.6-1 through 5.6-8. Monitoring wells MW-4 through MW-8 show essentially no variation with tidal fluctuations, thus indicating that silt from the old river bank could restrict any ground water flow toward the river from the southern two-thirds of the site. Piezometric levels observed in monitoring well MW-11B, which is screened in the glacio-fluvial sand, show minimal variation due to tidal influence. The average level in this monitoring well is approximately four feet below the levels observed in the fill, at the same location indicating a hydraulic potential for downward flow from the fill through the silt to the sand.

6.5.3 Hydraulic Conductivities

Estimates of horizontal hydraulic conductivity of the fill were obtained from field permeability tests on monitoring wells MW-1A through MW-8A. No data are available for estimating the hydraulic conductivity of the underlying units.

Hydraulic Conductivity of the Fill

Measured in situ hydraulic conductivities are summarized in Table 5.6.2-1. The range in hydraulic conductivity is from 2 to 300 feet per day and a representative value is approximately 25 feet per day. This is a relatively high value and indicates that the fill itself does not significantly retard the movement of ground water.

Hydraulic Conductivity of Lower Units

No data are available on the hydraulic conductivity of the units underlying the fill at the site. Based upon a review of the logs of the deep borings, it is estimated that the hydraulic conductivity of the glaciofluvial deposit ranges from 10 to 50 feet per day. This is the same range as the surficial fill.

Based upon comparison with values reported for similar materials in the literature, it is estimated that 0.003 feet per day ($1.0x10^{-6}$ centimeter per second) is a reasonable value for the average vertical hydraulic conductivity of the silt. This is a low value and indicates a significant potential for retarding the flow of ground water downward from the fill.

6.5.4 Ground Water Flow

Based upon the ground water level measurements and slug tests performed in the eight monitoring wells, estimates of ground water flow directions and rates in the fill were made. Estimates of the vertical downflow of ground water from the fill through the silt to the sand can also be made. Because only one monitoring well was installed in the glaciofluvial sand and none was installed in the Brunswick Formation, flow directions and rates can not be determined for these units.

Ground Water Flow in the Fill

Mean ground water level elevations and approximate ground water level contours for the fill at the site are shown in Figure 5.6-9. The data were obtained on October 14, 1984. Mean values, defined as the average of the maximum and minimum values in a tidal cycle, are shown for monitoring wells MW-1A, 2A, and 3A (obtained from Figures 5.6-1, 5.6-2, and 5.6-3, respectively). These mean values were determined on October 15; the corresponding water levels for the other monitoring wells were observed on the same day.

Ground water flow velocities in the surficial fill at the site were computed from the gradients (piezometric head divided by distance) developed from Figure 5.6-9 and hydraulic conductivities presented in

Table 5.6.2-1. Computed ground water velocities range from 0.6 to 4.0 feet per day from the center of the site north toward the river. Computed velocities from the center of the site toward the south range from 0.5 to 1.3 feet per day.

Figure 5.6-9 indicates a ground water mound trending east-west across the center of the site. Observations during the site investigation indicated that surface drainage was very poor in the central part of the site, particularly along the east side in the vicinity of MW-4A and MW-8A. Over a foot of standing water was observed at times in that area. Ground water levels in the two monitoring wells indicate a close connection between the standing water and surficial ground water levels (0.7 and 0.4 feet below ground surface in MW-4A and MW-8A, respectively) (Table 5.6.1-1). This ground water mound probably accounts for the apparent flow gradients to the south on the site. As can be observed from Figure 5.6-9, the ground water level at the southern end of the site (approximately 96 feet referenced to site datum elevation) is greater than that at the northern end (approximately 94 feet).

Ground Water Flow in the Silt

The vertical hydraulic gradient between the fill and the underlying glacio-fluvial sand was determined at the location of Wells MW-10A and MW-11B. The vertical hydraulic gradient at this location and estimates of the vertical hydraulic conductivity of the silt layer were used to calculate a range of possible ground water velocities from the fill through the silt into the glacio-fluvial unit. Assuming a thickness of the silt between 5 and 15 feet, the computed velocities ranged from 2×10^{-3} to 7×10^{-3} feet per day. Thus, the silt layer retards the flow of ground water and any associated contaminants from the fill to the sand. Lateral flow in the silt is not a concern because the overlying fill and underlying sand have much higher hydraulic conductivities.

Ground Water Flow in the Lower Units

One monitoring well was installed in the glacio-fluvial sand, but hydraulic conductivity testing was not performed. Therefore, insufficient information is available to estimate flow rate and direction for this unit. Similarly, no information regarding the Brunswick Formation was obtained as part of this investigation, since none of the borings reached this unit.

6.5.5 Extent of Contamination

Analysis of samples taken from the eight on-site wells has confirmed the presence of dioxin in the ground water. Contamination was present in 15 of 17 water samples collected, ranging from 0.0059 ppb in monitoring well MW-5A to 10.4 ppb in MW-2A.

The results indicate that contamination is greatest at the north end of the site along the river, near the process and chemical manufacturing buildings. Monitoring wells MW-5A, 6A, and 7A, located at the south and southwestern portions of the site, consistently had the lowest dioxin levels, ranging from ND to a maximum of 0.016 ppb; monitoring wells MW-4A and MW-8A along the eastern edge at the site had dioxin levels ranging from 0.20 to 1.1 ppb; monitoring wells MW-1A, 2A, and 3A located on the northern edge of the site showed levels ranging from 0.03 to 10.4 ppb dioxin.

Three ground water samples from monitoring well MW-2A in the center of the north end of the site had dioxin results of 7.9, 4.3 and 10.4 ppb, all significantly higher than any other ground water sample dioxin result. These very high levels of dioxin in water are probably the result of the presence of a contaminated solvent or other carrier that has solubilized in the ground water or because dioxin-contaminated collodial soil particles are suspended in the water.

Results of the priority pollutant analyses also confirmed the presence of a number of compounds in the ground water. The highest concentrations of semivolatile organic and chlorinated herbicide compounds occur in the northernmost monitoring wells. Ground water samples from MW-2A, which had the highest dioxin concentration results, also had the highest priority pollutant concentrations of the on-site wells sampled.

In general, the most prevalent compounds found in the ground water in significant concentrations are the chemicals associated with the production that took place on the site, i.e., 2,4-DCP, 2,4,5-TCP, 4,4'-DDT, 2,4-D and 2,4,5-T.

6.6 River Sediments

Analysis of the Passaic River sediment samples has confirmed the presence of dioxin in the river sediment. A total of 36 samples were collected from the river bottom--23 samples from zero to 12 inches and 13 samples from depths of 12 to 24 inches. Of the 36 sediment samples analyzed, 26 had positive dioxin results. Dioxin concentrations ranged from 0.53 to 10.8 ppb, with six nondetects in samples taken from zero to 12 inches, and from 0.63 to 130 ppb, with four nondetects in samples collected from 12 to 24 inches. A subsequent resampling effort of the sample location with the highest initial dioxin result (Station 1-3-0) resulted in five additional positive dioxin results and a highest recorded concentration of 450 ppb at a depth interval of 66 to 72 inches.

Based on these results, dioxin contamination in the river appears to increase with depth. The upper samples (zero to 12 inches) show significantly less contamination than the lower (12 to 24 inch) samples. This is probably due to silt deposition buildup on the river bottom. It was also observed that the south bank of the river has greater contamination than the north bank, especially opposite and just downstream from the plant site.

A total of 15 sediment samples were analyzed for priority pollutants--10 at depths of zero to 12 inches and five at depths of 12 to 24 inches. Subsequent analysis confirmed the presence of a number of compounds.

In general, the upper (zero to 12 inch) samples showed higher values of semivolatile organics, equivalent values of inorganics and volatile organics, and lower values of pesticides than the 12- to 24-inch depth interval samples. The compounds with the highest concentrations detected were chemicals produced on the site, including 2,4-DCP, 2,4,5-TCP and their esters. Other compounds found in a significant number of the samples included the various metals, fluoranthene, phthalates and pyrene.

6.0 REFERENCES

Lovegreen, J. R., 1974, Paleodrainage History of the Hudson Estuary, Masters Thesis, Department of Geology, Columbia University, New York, NY, 152 p.

Nichols, W. D. 1968, Ground Water Resources of Essex County, NJ, NJDEP, Division of Water Resources Special Report 28, 56 p.

TABLES

TABLE 6.3-1

ESTIMATED VOLUME OF CONTAMINATED MATERIALS
FROM MAJOR BUILDINGS

BUILDING	(SLAB) CONCRETE (yd^3)	CONCRETE BLOCK OR BRICK (yd^3)	WOOD OR PLASTER (yd^3)	ROOF MATERIAL (yd^3)	STEEL GRATING (yd^3)	STRUCTURAL STEEL (yd^3)	CORRUGATED ASBESTOS PANELS (yd^3)	TOTAL (yd^3)
Office and Laboratory	100	310	180	110	-	-	-	700
Warehouse	480	160	40	-	-	100	30	810
Process	110	110	-	25	40	100	15	400
Chemical Manufacturing	475	610	-	25	60	80	20	1,270
TOTAL	1,165	1,190	220	160	100	280	65	3,180

TABLE 6.4.2-1

2,3,7,8-TCDD CONCENTRATION RANGES VERSUS NUMBER OF SAMPLES ANALYZED

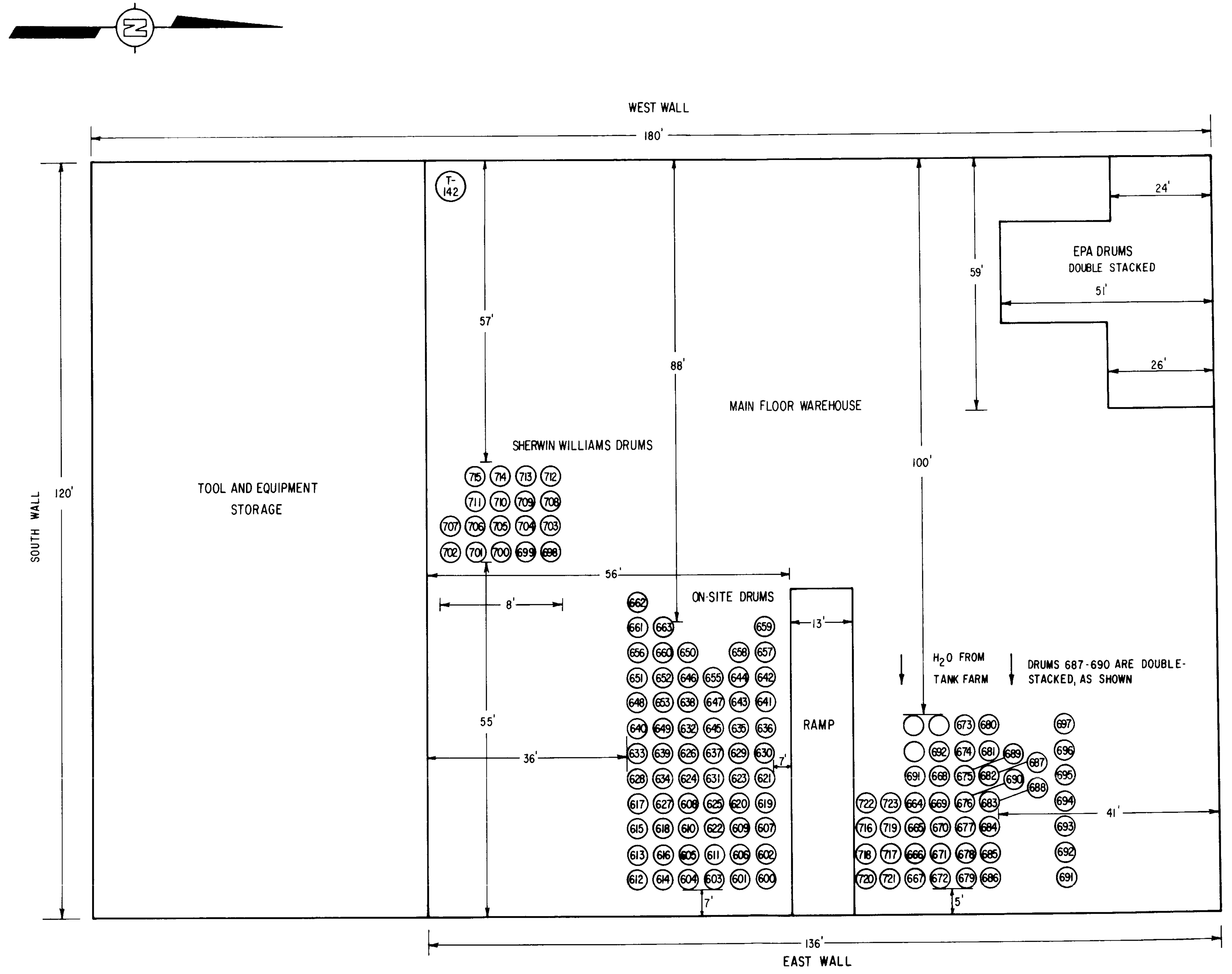
DIOXIN CONCENTRATION RANGE (ppb)	FILL LAYER DEPTH INCREMENT (inches)		
	0 to 6	6 to 12	12 to 24
<50	7N* + 1B**	9N + 3B	11N + 2B
50 to 200	4N + 3B	4N + 1B	3N + 3B
200 to 500	6N + 1B	5N + 1B	4N + 1B
>500	4N + 3B	3N + 3B	3N + 2B

*N refers to samples collected in the near surface soil sampling program.

**B refers to samples collected in the boring soil sampling program.

FIGURES

DRAWN BY	TRS	CHECKED BY	JTO	2-15-85	DRAWING NUMBER 846248-B2
	11-7-84	APPROVED BY	DGE	2-15-85	



NOTE:

FOR PLAN AND LOCATION OF WAREHOUSE, SEE FIGURE No. 4.2.3.2-4.

FIGURE 6.2-1

LOCATION OF DRUMS
WAREHOUSE

PREPARED FOR

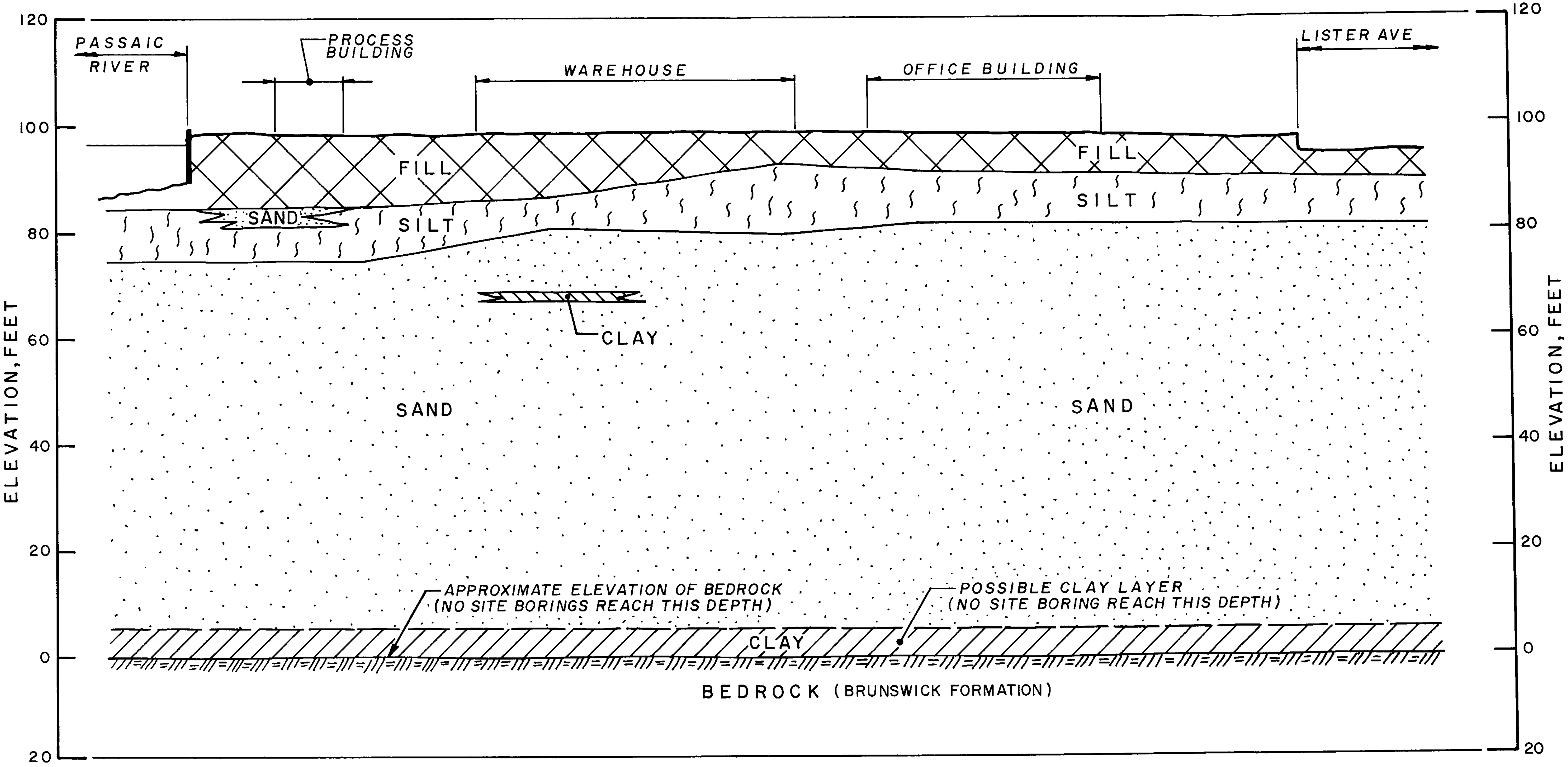
DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

65360

Do Not Scale This Drawing

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
D. Weick 2-4-85	JTO 2-15-85	OGE 2-15-85	846248-B22



(CROSS SECTION LOOKING EAST)

VERTICAL SCALE
0 20 20 FEET

HORIZONTAL SCALE
0 60 120 FEET

VERTICAL EXAGGERATION 3X

NOTES:

1. ELEVATIONS ARE WITH RESPECT TO SITE DATUM.
2. THICKNESSES OF SUBSURFACE STRATA ARE BASED ON SECTION B-B' (FIGURE No. 4.2.5-3) AND ARE REPRESENTATIVE OF TYPICAL SUBSURFACE CONDITIONS.

FIGURE 6.4.1-1

SCHEMATIC CROSS SECTION
OF SITE

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

IT ...Creating a Safer Tomorrow

65380

"Do Not Scale This Drawing"

7.0

7.0 CONCLUSIONS AND RECOMMENDATIONS

The investigation documented in this report has provided considerable data related to existing site conditions. Some conclusions regarding the extent of contamination and the need for additional data can be drawn from the results obtained thus far. Following is a brief discussion of the conclusions drawn to date and recommendations for future activities to provide the necessary input for a feasibility study.

7.1 DRUMS

Of the 570 drums on site from former plant operations, 180 have been demonstrated to have nondetectable dioxin concentrations. These drums should be segregated, externally decontaminated, and disposed of off site. The contents of the drums generated by the NJDEP, EPA, and Diamond Shamrock during off-site remedial activities and initial site stabilization should be combined with other like materials (i.e., decontamination water, tyvek clothing, etc.) currently being generated on site; the resulting empty drums could be used for continuing activities on site or decontaminated and removed from the site. The materials remaining after this consolidation and segregation will be addressed as part of the feasibility study.

7.2 BUILDINGS

With the possible exception of the office and laboratory building, the buildings on the site are highly contaminated and constructed of materials that make decontamination impractical. It is anticipated that the feasibility study will recommend demolition of these structures. Decontamination of nonporous materials, such as structural steel members, to permit their removal from the site for disposal will be evaluated as part of the feasibility study, as will the final disposal of the building rubble.

7.3 TANKS AND PIPING

All of the tanks sampled were determined to be contaminated. The feasibility study will address the potential for successful decontamination of these vessels for off-site disposal as scrap metal. All piping is considered to be contaminated either with dioxin, asbestos, or other chemicals, and disposal will be addressed in the feasibility study.

7.4 SEWERS

All sewers and sumps sampled had detectable concentrations of dioxin. The contamination levels decrease with increasing distance from the process area. Because these sewers are still open and constitute a possible route of off-site migration of dioxin, they should be plugged. (It is noted that a survey of the area sewers performed by NJDEP in 1983 demonstrated no dioxin in the sewers.) Remediation of these facilities will be addressed in the feasibility study.

7.5 SOILS

The data indicate that the surficial fill layer is contaminated. The contamination extends deepest on the northern boundary of the site where the fill is thickest. More data are needed to adequately define the extent of contamination with depth. To further define this aspect of the site, archived samples from the fill and silt layer will be analyzed for dioxin. Depending on the results of these analyses, a geostatistical model may be used to optimize sample locations in an extended boring program.

It is not known to what extent dioxin has penetrated the silt layer underlying the site. This will be addressed by proceeding with the boring program presently proposed to the NJDEP. These data are required for the feasibility study.

7.6 GROUND WATER

The surficial (fill zone) aquifer has been demonstrated to be contaminated. It is not known whether or not the contamination has passed through the silt layer into the glacio-fluvial sand aquifer or into the bedrock of the Brunswick Formation.

The subsurface hydrogeology, particularly that of the aquifers underlying the silt, needs to be further defined so that potential contaminant migration and possible remedial measures can be evaluated. This information will be an important input to the feasibility study.

7.7 RIVER SEDIMENTS

The river sediment sampling program confirmed the EPA data for the surface sediments and extended the data base to include sediments at a greater depth. The lower sediments have been shown to contain higher levels of dioxin than the shallow sediments. The lateral and vertical extent of this contamination has not been determined.

A more extensive sediment sampling program will be prepared using geostatistics as a planning tool. A hydrographic survey of the river above and below the site has already been performed. Data from this survey will be used to prepare a sediment sampling program to define the extent of river sediment contamination.