SDMS Document
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NEWARK BAY STUDY AREA

ADDITIONAL SITES AND CANDIDATE PRPS FOR THE NEWARK BAY STUDY AREA

VOLUME II OF II

PRP DATA EXTRACTION FORM AND EVIDENCE CONCERNING:

WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY SITE

PREPARED BY:
TIERRA SOLUTIONS, INC.

SUBMITTED TO:
USEPA REGION II

APRIL 2009

INDUSTRIAL DIRECTORY OF NEW JERSEY

N. J. BUREAU OF STATISTICS

1949

NEWARK
N.J.P.L.

BAD000002

ESSEX COUNTY (contd.)

NEWARK (contd.)

Strait & Richards, Inc.....23-43 Selvage
Strand Furniture & Upholstery Co.
538 Springfield ave.
Streicher Mfg. Co.....30 Court
Striny, Mathias.....757 S. 20th
Strouse, C.....115 Seth Boyden ter.
Structural Iron and Steel Corp.
72-82 Lockwood
Stuart Engineering & Manufacturing Company.....907 Frelinghuysen ave.
Sturm, J., & Sons, Inc.....864 Clinton ave.
Sty-Jar, Inc.....33 St. Francis
Stylecraft Manufacturing Co.
335 Central ave.
Suchomel, Karl.....35-37 Esther
Summonte Wine Co.....120 Eighth ave.
Sun Glass Industries.....10 Fenwick
Sun Oil Co.
Sun Pleating Co.....6 W. Park
Sunshine Photo Service, Inc.....378 Broad
Super-Foam Cleaner Co...65 Bloomfield ave.
Superior Air Products Co.....132 Malvern
Superior Bolt & Nut Co.....165 Mulberry
Superior Cleaners, Inc.....422 S. 12th
Superior Cutter Grinding Service
128 Stuyvesant ave.
Superior Electrical Supply Co..142 Mulberry
Superior Stamp & Die Wks...206-8 Market
Supreme Bedding Co....1035 S. Orange ave.
Supreme Knife Grinding Co.
153 Frelinghuysen ave.
Supreme Table Pad Co.....525 Market
Supreme Zipper Bag Corp....825 Broadway
Superior Auto Parts Co., Inc.
210 Central ave.
Sure Rest Bedding Co., T/A Esther Gennet and Jacob Gennet.....151-161 Fabyan pl.
Sussex Brake Service.....54 Sussex ave.
Sussex Cutlery.....224 Sussex ave.
Swan Finch Oil Corp.....120 Lister ave.
Swanson & Stehli.....710 Springfield ave.
Swenson & Co.....773 S. 16th
Swift & Co.
Synthetic Plastics Co.....88 St. Francis
Synthetic Resin & Chemical Corp.
380-386 South
Tagliabue, C. J. Corporation
614 Frelinghuysen ave.
Talarico, Gaetan.....604 Mt. Prospect ave.
Tango Electro Coatings Co...116 Varsity rd.
Tannenbaum & Kramer.....24 19th
Tanstead Tool & Die Co.....4 Bruen
Tapper, Saul & Sons.....412 Halsey
Tartaglia, P.....230 14th ave.
Taylor & Co.....131-145 Ogden
Taylor, William H., & Co.....68 Orchard
Teitelman-Danziger, Inc...101-103 Arlington
Tek Bearing Co., Inc.....100 Washington
Tenax Finishing Products Co....420 Adams
Tenney Engineering, Inc.....26 Ave. B
Terra Chemicals, Inc.....413 South
Test Rite Optical Company.....250 Market
Tetaz & Co.....50 Columbia
Teuber Optical Co., Inc.....206-8 Market
Textile Products.....181 Chestnut
Thomas Manufacturing Corp.....80 Clinton
Thompson Bros.....486 S. 11th

ESSEX COUNTY (contd.)

NEWARK (contd.)

Thompson, J. P., Co.....215-17 Plane
Tidewater Baling Corp.....26 St. Charles
Tiffany & Co.....820 Highland ave.
Tilp, J. G., Inc.....312-320 Adams
Tilton Dairy Farms...110 Mt. Pleasant ave.
Tinkl, Erna.....528 15th ave.
Tischler, Ted, Printers.....113 William
Titeflex, Inc.....500 Frelinghuysen ave.
To-Ed Sportswear Co., Inc.....37-39 George
Toelle Research Laboratories..163 Clifford
Tomkins Brothers.....74 Passaic
Tonks Bros. Mfg. Co...1197 McCarter hwy.
Tools, Inc.....203 N. 12th
Toplansky Bros.....78 S. Orange ave.
Tops Metal Products.....347 Ferry
Toy Mart Co., The,.....314 Market
Trade Laboratories, Inc.....412 Halsey
Trade Typesetters, Inc.....200 Mulberry
Traenkle, John.....30 Becher st.
Traffic & Street Sign Co.....80 Foundry
Trailmobile Co., The.....58-62 Montgomery
Trans-Pac Service, Inc.....66 S. Eighth
Traud Machine Co.....126-128 Polk
Trautz Co., Inc.....10 Delancy
Trent Hat Corp.....329 N. Fifth
Triangle Gage Tool & Die Co....13 Governor
Triangle Radio Tubes, Inc.....39 Division
Triangle Welding Works.....84 Hartford
Triplex Oil Refining Co., Inc...80 Lester ave.
Trowbridge Outdoor Advertising Corp.
86 Frelinghuysen av
Truckor Corp., The.....156 Wilson ave.
Tuchman Bros., Inc.....55 St. Francis
Tudor Products Co.....57 E. Alpine
Tung-Sol Lamp Works, Inc...95 Eighth ave.
Tungsten Alloy Manufacturing Co.
65 Golden
Tunley-Walsh Paper Prods. Co.
955 McCarter hwy.
Turner Lumber Company..540 S. Orange ave.
Turner Tanning Machinery Co., The,
59-61 E. Alpine
Twentieth Century Cabinet Co...298 S. 10th
Ulanet, George, Co.....413-415 Market
Ullrich Sign Co.....153 Hudson
Uneeda Laundry.....142-148 S. 14th
Uneke Manfg. Co.....126 Green
Unfried-Barkhorn Co.....374 Plane
Union Carbide & Carbon Corp.
(apparatus div.)...646 Frelinghuysen ave.
Union Chemical Corporation
410 Frelinghuysen ave.
Union Electric Products Co.....24 Edison pl.
Union Laundry Co.....124-48 S. 15th
Unique Art Mfg. Co., Inc...200 Waverly ave.
United Apparel, Inc.....276 Halsey
United Awning Co.....642 Springfield ave.
United Box & Lumber Co.....Delancy
United Carbon Company, Inc.
Brown & Lister ave.
United Diamond Works.....45 Hamilton
United Die Co.....46 W. Kinney
United Dress Co.....263 Halsey
United Electronics Co.....42 Spring
United Hat Fur Cutting Co...348-356 South
United Pure Meat Products, Inc...202 Prince

1972

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NEWARK
ESSEX COUNTY
DIRECTORY OF BUSINESS

Free Public Library, Newark, N. J.

Information as supplied by the firms
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N. J. REFERENCE DIVISION

Greater Newark Chamber of Commerce
1180 Raymond Boulevard
Newark, New Jersey 07102
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BAD000003

sets: $325,000,000
SIC 6022
Pr—Anthony M. Surano
Exec/Vp—Joseph R. Cassidy
VP—William B. Denver
Sec—Theodore R. Hanzl
744 Broad Street
487 Orange Street
795 Sanford Avenue
618 Central Avenue
10 Greenwood Avenue

CASEY, W.J. TRUCK & RIGGING CO.
184 Doremus Ave.
Newark, N.J. 07105
Phone: 589-8444
Emp: 16
Heavy Machinery Hauling
SIC 4214
Pr—Nicholas Biondi

CASHA NOVELTY CO., INC.
764 McCarter Highway
Newark, N.J. 07102
Phone: 642-3479
Emp: 50
Millinery Novelties
SIC 2396
Pr—Jerry C. Casha
Sec—Catherine M. Casha

CASSER TOURS
Div. of: Manhattan Transit
39 Commerce Street
Newark, N.J. 07102
Phone: 624-5333
Travel and Tours
SIC 4721
G/M—I. Edward Gilden

CASTROL OILS, INC.
254-266 Doremus Avenue
Newark, N.J. 07105
Phone: 344-8262
85,000 Sq. Ft.; 1,846 Acres
Emp: 45
Office: M 23, F 5
Plant: M 17
Lubricating Oils and Greases
SIC 2992
Pr—Martin J. Donahue
VP—John Cameron
VP—William Connors
Sec—Robert Anderson
O/M—George Goodrich
A/M—John T. Witterschein
P/M—Steve Rychlicki
Main Office Castrol Oils, Inc.- New York, N.Y. 10019- Phone: 212-765-6740

CATHY DRESS COMPANY
263 Halsey Street
Newark, N.J. 07102
Phone: 622-6338
Emp: 20
Dress Manufacturers
SIC 2335
Owner—H. Szadman

CELANESE CHEMICAL CO.
354 Doremus Avenue
Newark, N.J. 07105
Phone: 589-2705
Emp: 39
Formaldehyde and other Bulk Chemicals
SIC 2818
Pr—Worth D. Coble
T/M—J. F. Baxter

CELANESE COATING CO.
Delancy & Rutherford Streets
Newark, N.J. 07105
Phone: 877-2300
Emp: 166
Paints, Lacquers and Allied Products
SIC 2851

CELANESE PLASTICS COMPANY
Div. of: Celanese Corp.
550 Broad Street
Newark, N.J. 07102
Phone: 877-2300
Emp: 300
★Acetate Film Sheet Resins
SIC 2821
Pr—R.T. Daily
VP—T. Welsh
VP—R. J. Prochaska
VP—R. Austin
VP—R. Schroeder
S/M—J. B. Mitchell
A/M—D. M. Rutkin
P/R—J. W. Shenton
P/A—John White
Pers/M—S. Baker
P/M—R. Seddon
Plants at
Belvidere, Warren County
Newark, Essex County
Laboratory-Clark, Union County
Main Office:
New York, N.Y.

CELLOMER CORPORATION
Div. of: Polychrome Corp.
46 Albert Avenue,P.O. Box 25
Newark, N.J. 07105
Phone: 589-3875
40,000 Sq. Ft.
Emp: 18
Resins
SIC 2821
Ch/B—Gregory Halpern
Pr—Stanley Eysmann
VP—William Dodds
VP—Bernard Gold
VP—Allen Coopersmith
VP—Louis Kaplan
Sec—Florence Reinken
Comp—Frank Hardy
O/M—Walter Taylor
P/A—Andrew Regan

CENTERLESS PRODUCTS CO., INC.
27 Verona Avenue
Newark, N.J. 07104
Phone: 482-6847
Emp: 19
Screw Machine Products
SIC 3451
Pr—John W. Draghi

CENTRAL CADILLAC INC.
360 Central Ave.
Newark, N.J. 07103
Phone: 624-2255
Emp: 135
Sells & Maintains Used & New Cars
SIC 5300
G/M—Gary Postell

CENTRAL MACHINE SHOP
224 Sussex Avenue
Newark, N.J. 07103
Phone: 482-0443
Emp: 3
Machine Parts
SIC 3599
Pr—Kurt Young

CENTRAL PAPER CO.
765 McCarter Hwy.
Newark, N.J. 07102
Phone: 623-6377
100,000 Sq. Ft.
Emp: 46
Office: M 19, F 9
Plant: M 18
Jobbers of Fine Papers and Envelopes
SIC 2642
Pr—Robert H. Berkowitz
Exec/Vp—Herbert I. Cohen
VP—Joseph Englander
G/M—Anthony Migacz
O/M—Anne Sornstein

CENTRAL RAILROAD COMPANY OF NEW JERSEY, THE
1100 Raymond Boulevard
Newark, N.J. 07102
Phone: 643-6800
53,000 Sq. Ft.
Emp: 3500
Railroad
SIC 4011
VP—(Law)—R.B. Wachenfeld
Sec—J. W. Leppington
G/M—J. R. Walsh
S/M—B. J. Strongin
Mkt/Dir—J. L. Barngrove, Jr.
P/R—N. W. James
P/A—W. A. Kelley

CENTRAL STEEL DRUM CO.
704 Doremus Avenue
Newark, N.J. 07105
Phone: 621-8500
Emp: 70
Office: F 2
Plant: M 68
Reconditioning Steel Drums
SIC 3491
Partners:
Jack Rosa
Eddie Fischer
Alice Greenberg

CENTURY GLOVE CORPORATION
165 Vanderpool Street
Newark, N.J. 07114
Phone: 243-0730
25,000 Sq. Ft.
Emp: 220
Gloves-Work All Types
SIC 2381
Ch/B—Samuel Bronstein
Exec/Vp—Steve Hollander
VP—Sidney I. Babat
T/M—Charles J. Howell
P/M—James Ellmer
M/M—Charles Cinderella

CENTURY LOAN CO.
838 Broad Street
Newark, NJ 07102
Phone: 642-2865
Emp: 2
Pawnbroker-Retail General Merchandise/Cameras, TV, Luggage, Musical Instruments
SIC 5300

CENTURY WIRE PRODUCTS CORP.
20 Kent Street
Newark, N.J. 07108
Phone: 824-2211
33,000 Sq. Ft.
Emp: 15
Wire Specialties
SIC 3481
Pr—A. Gaydos
P/A—Joseph Gaydos

CHAMPI IRON WORKS
50 Nesbitt Street
Newark, N.J. 07103
Phone: 621-7649
Emp: 12
Iron Works-Stairs, Railings
SIC 3449
Partners:
Jerry Champi
Peter Champi

CHAPAL DONNER CORP., THE
29 Clover Street
Newark, N.J. 07105
Phone: 623-3026
90,000 Sq. Ft.
Emp: 71
Mfrs. of Hatters Furs
SIC 2396
Pr—Carl H. Donner
Tr—G. McKeon

CHASE CHEMICAL CO.
280 Chestnut Street
Newark, N.J. 07105
Phone: 589-8181
Emp: 160
Pharmaceutical Preparations
SIC 2834
Pr—Sydney Chasman
Sec—Randolph Chasman

CHASEN, M. & SONS, INC.
20 Esther Street
Newark, N.J. 07105
Phone: 589-8700
Emp: 52
Cotton Felt
SIC 2294
Pr—Paul Chasen
Sec—Ettie Chasen

CHEKER STAMPING & MFG. CORP.
56-58 Elm Street
Newark, N.J. 07105
Phone: 623-3530
10,000 Sq. Ft.
Emp: 45
Short Run Metal Stamping and Tool and Die
SIC 3461
Pr—S.A. Grzegorzek
VP—F.S. Kovach
VP—F.J. Cipko

CHELSEA TITLE & GUARANTY CO.-LAWYERS UNION DIVISION
800 Broad Street
Newark, N.J. 07102
Phone: 643-2300
20,000 Sq. Ft.
Emp: 400
Real Estate Title Insurance, Assets: $9,000,000
SIC 6531
Pr—Elwood F. Kirkman
VP—H. H. Lomley
VP—James J. Egan, Jr.
Sec—James A. McCarthy
Branches:
Hackensack, N.J.
Paterson, N.J.
Rutherford, N.J.
Trenton, N.J.

CHEM-FLEUR, INC.
200 Pulaski Street
Newark, N.J. 07105
Phone: 589-4266
15,000 Sq. Ft.; 1 Acre
Emp: 30
Office: M 3, F 2
Plant: M 25
Aroma - Flavor Chemicals
SIC 2899
Pr—J.J. Plocek
Exec/Vp—T.J. Plocek
VP—Barry Schaffer
Sec—F. H. Plocek

CHENEY & CO., INC.
764 McCarter Highway
Newark, N.J. 07102
Phone: 622-5440
Emp: 15
Heat Exchangers
SIC 3443

CHERIN DRESS MFG. CO., INC.
100 Shipman Street
Newark, N.J. 07102
Phone: 623-4482
Emp: 65
Women's, Misses' Dresses
SIC 2335
Owner—George Cherin

CHESEBRO-WHITMAN CO., INC.
Div. of: Patent Scaffolding Co.-Harsco Corporation
429 Frelinghuysen Avenue
Newark, N.J. 07114
Phone: 248-2340
Emp: 45
Ladders, Scaffolding
SIC 2499
Pr—J.T. Simpson
VP—J.G. Underwood
Sec—C.R. Marsh
G/M—Murray Dutcher

CHESLOFF'S INC.
11 Halsey Street
Newark, N.J. 07102
Phone: 622-2927
Emp: 15
Womenswear, Retail
SIC 5300
Pr—Raymond Chesloff

CHESTNUT WOODWORKING & LUMBER CO.
376 Chestnut St.
Newark, N.J. 07105
Phone: 622-7101
Emp: 8
Lumber and Millwork, Packing Cases, Pallets - Crates
SIC 2431
Owner—Peter Fresulane

CHESTON CO.
Sub. of: Lovell Industries Inc.
1427 McCarter Hwy.
Newark, N.J. 07104
Phone: 485-3749
Emp: 27
Industrial Process Furnaces and Ovens
SIC 3567

Emp: 4,000
Copper, Steel, Brass, and Plastic Tube, Pipe, and Wire Products, Vending Machines, Background Music Systems
SIC 3644
Ch/B—Carl S. Menger
Pr—E.J. Simmons
Ch/Ex/Off—Carl S. Menger
VP—(Oper) J.M. Scater
VP—(Purch & Trans) B.A. Johnson
VP—Herbert W.B. Farr
VP—(Fin) Edward M. Moran
Sec—Neale F. Hooley
Tr—Edward M. Foran
Comp—B.J. Wood

TRIM LINE
16 Main St.
Newark, N.J. 07105
Phone: 642-9795
Emp: 100
Rain Wear
SIC 2385
Owner—Albert Trim

TRI-STATE LITHO SERVICE
66 Shipman Street
Newark, N.J. 07102
Phone: 643-5739
Emp: 8
Commercial Printing
SIC 2752

TROY CHEMICAL CORP.
1 Avenue L
Newark, N.J. 07105
Phone: 589-2500
20,000 Sq. Ft.
Emp: 60
★Chemicals
◆SIC 2819
Pr—Elias Singer
VP—Milton Nowak
Sec—William Singer
G/M—Milton Nowak
Mkt/Dir—E. Wanderman
Ch/Eng—C. R. Mcchesney

TROY RUBBER ENGRAVING CO.
258 South Street
Newark, N.J. 07105
Phone: 624-3032
10,000 Sq. Ft.
Emp: 9
Office: M 1, F 1
Plant: M 7
Machine Molded and Hand Engraved Rubber Printing Plates
SIC 3069
Pr—Milton J. Rapfogel
Sec—Rita Rapfogel
Tr—Adele Fulop

TURNER, DOUGLAS, INC.
185 Foundry St.
Newark, N.J.
Emp: 3
Advertising
SIC 7311

TURNER TANNING MACHINERY DIVISION
Div. of: United Shoe Machine Corp.
111 N.J. Railroad Avenue
Newark, N.J. 07105
Phone: 623-8092
Emp: 4
Machine Shop, Jobbing and Repairing Tanning Machines
SIC 3599
G/M—Frank Stewart

TWENTY PARK PLACE CORP.
20 Park Place
Newark, N.J. 07102
Phone: 623-4080
50,000 Sq. Ft.
Emp: 3
Hotel
SIC 7011
Owner—David Phillips
VP—Bernard N. Levin
VP—Gladys Altman
Sec—Gusta Phillips
G/M—Klaus Mancold

U.S. INDUSTRIAL CHEMICALS CO.
Div. of: National Distillers & Chemical Corporation
300 Doremus Avenue
Newark, N.J. 07105
Phone: 589-3813
Emp: 40
★Alcohols, Chemicals, Solvents
SIC 2818
G/M—T. B. Frey
S/M—E. C. Richardson
Mkt/Dir—W. H. Rader

U. S. REALTY & INVESTMENT CO.
972 Broad Street
Newark, N.J. 07102
Phone: 622-5959
Emp: 50
Realtors & Investors
SIC 6531
VP—O. Hirsch

U. S. SAVINGS BANK
772 Broad St.
Newark, N.J. 07102
Phone: 624-5800
Emp: 28
Bank
SIC 6000
VP—H. Holland

UDIN, BARON, LUMBER CO., INC.
150 Avon Avenue
Newark, N.J. 07108
Phone: 248-3800
Emp: 11
Millwork
SIC 2431

ULANET, GEORGE CO.
413-415 Market Street
Newark, N.J. 07105
Phone: 622-4876
Emp: 27
Thermal Controls & Heating Elements
SIC 3822
Pr—H. Ulanet
VP—A. Ulanet
Sec—S. Lennett

ULLRICH SIGN CO., INC.
Div. of: Maier Sign Co.
153 Hudson Street
Newark, N.J. 07103
Phone: 622-1640
60,000 Sq. Ft.
Emp: 13
Office: M 2, F 1
Plant: M 10
Manufacturing and Maintenance of Signs
SIC 3993

UNION CAMP CORP.
235 Rome St.
Newark, N.J. 07105
Phone: 589-0341
Emp: 21
Set-up Paperboard Boxes
SIC 2652

UNION CARBIDE CORP.
Linde Division
P. O. Box 5095
Newark, N.J. 07105
Phone: 623-7435
Emp: 34
Acetylene
SIC 2813
Main Office:
270 Park Avenue New York City

UNION CARBIDE CORP.
Linde Division
646 Frelinghuysen Avenue
Newark, N.J. 07114
Phone: 243-6300
Emp: 250
Office: M 70, F 30
Plant: M 150
★Gas and Electric Apparatus for Welding, Cutting, Surfacing, Shaping, Metal Melting
SIC 3433
G/M—G.M. Skinner
O/M—B.O. Roberston
Pers/M—A.G. Marcus
R/D—R.M. Gage
P/Eng—A.G. Smalley
Main Office 270 Park Avenue- New York City, N.Y.

UNION CHEMICAL CORP.
410 Frelinghuysen Ave.
Newark, N.J. 07114
Phone: 248-0800
Emp: 7
Paints & Lacquers
SIC 2851

UNION CONTAINER CORP.
439 Frelinghuysen Ave.
Newark, N.J. 07114
Phone: 242-3600
Emp: 35
Boxes
SIC 2655
Pr—F. J. Lenox
VP—A. Onufer
Sec—A. M. Lenox

UNIQUE HEADBOARD CO., INC.
68 Clifford Avenue
Newark, N.J. 07107
Phone: 622-8261
20,000 Sq. Ft.
Emp: 26
Office: F 4
Plant: M 20, F 2
Upholstered Headboards and Chairs, Bars & Tables
SIC 2512
Pr—J. Englander

UNITED ADVERTISING CORP.
354 Park Ave.
Newark, N.J. 07107
Phone: 483-0215
Emp: 95
Advertising Specialties
SIC 3993

UNITED AIR LINES
1180 Raymond Blvd.
Newark, N.J. 07102
Phone: 643-2500
Emp: 1,644
Air Transportation
SIC 4511
Pr—George E. Keck
Exec/Vp—C.F. McErlean
Sec—R.A. Dimpfl
Tr—R.H. Robertson
S/M—M.O. Shuster, Jr.

UNITED APPAREL INC.
461-467 Frelinghuysen Ave.
Newark, N.J. 07114
Phone: 243-3337
Emp: 1,644
Girls and Infants Coats
SIC 2363

UNITED BUMPER SERVICE CORPORATION
Electro Chemical Industries
24 Legal Street
Newark, N.J. 07114
Phone: 248-1665
35,000 Sq. Ft.
Emp: 44
Office: M , 2 F , 1
Plant: M , 41
Reconditioning Auto Bumpers
SIC 7539
Pr—Virgil Benton
Exec/Vp—John Jordon
VP—Charles Beckmann
G/M—Al Ronco
S/M—Charles R. Edris

UNITED CASING CORP.
28 Margarette St. & 303 Wilson St.
Newark, N.J. 07105
Phone: 589-5674

Emp: 30
Bottled Soft Drinks
SIC 2086

UNITED COMMUNITY FUND & COUNCIL OF ESSEX & WEST HUDSON COUNTIES, N.J.
45 Branford Place
Newark, N.J. 07102
Phone: 623-6030
Emp: 56
Non-profit Fund Raising Organization
SIC 8611
Pr—Peter Cartmell
Sec—John J. McAuliffe, Jr.
Tr—Robert R. Ferguson, Jr.
Bellville Community Council
Nutley, N.J. 07110
Irvington Community Council
Newark, N.J. 07102
Nutley Community Service Council
Nutley, N.J. 07110
Oranges & Maplewood Community Service Council
Orange, N.J. 07050
West Hudson Community Council
991-7484

UNITED ELECTRONICS CO.
42 Spring Street
Newark, N.J. 07104
Phone: 484-6300
48,000 Sq. Ft.
Emp: 62
★Electron Tubes
SIC 3671
Pr—Michael T. Gasparik
Sec—John Barbera

UNITED ENGINEERS & CONSTR.
Div. of: Raytheon Corp.
60 Park Place
Newark, N.J. 07102
Phone: 623-7679
Design & Construction of Public Service & Power Works Plants
SIC 1510
G/M—Mr. Millner

UNITED FUR CUTTERS
Div. of: Bieber-Goodman Associates
350 South St.
Newark, N.J. 07105
Phone: 344-2256
30,000 Sq. Ft., .6 Acres
Emp: 37
Office: M 2, F 1
Plant: M , 14 F , 20
Manufacturing Hatters Fur
SIC 2371
G/M—J. Lampariello

UNITED HOSPITALS OF NEWARK
15 South Ninth St.
Newark, N.J. 07107
Phone: 484-8000
Emp: 1,460
Health Care
SIC 8061
P/R—Vincent J. Biunno
Exec. Dir.—Peter R. Haviland

UNITED LABEL CORP.
65 Chambers Street
Newark, N.J. 07105
Phone: 589-6500
Emp: 8
Labels & Name Plates
SIC 2641
Owner—Norman Ciarrocca

UNITED RADIO CAB
137 Hudson Street
Newark, NJ 07103
Phone: 643-3100
Taxi
SIC 4121
G/M—Rocco Rafanello

UNITED RADIO CO.
56 Ferry Street
Newark, N.J. 07114
Phone: 623-7470
Emp: 15
Electronic Parts & Tubes
SIC 3679
Pr—Herman Lubinsky
Comp—I. Thomson
G/M—Charles Manz
S/M—Fred Mendelsohn

UNITED RECORD CORP.
111 N.J. Railroad Avenue
Newark, N.J. 07105
Phone: 642-3885
Emp: 24
Phonograph Records
SIC 3652
Pr—C. Heath
VP—H. Gerke
Sec—W. Borak

UNITED STATES BOX CORP.
1296 McCarter Highway
Newark, N.J. 07104
Phone: 481-2000
50,000 Sq. Ft.

1977
NEW JERSEY STATE INDUSTRIAL DIRECTORY

PUBLISHED SINCE 1901

NEW JERSEY STATE INDUSTRIAL DIRECTORY
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BAD00004

P/A—J. Kuhn
P/F—L. Szasz
P/Eng—S. Reiter

KOLLER, E. L. MFG & COAL CHUTE CO., INC.
94-96 First St.
Newark, NJ, 07107
Phone: 201-483-0333
Emp: 6
Concrete Pouring Chutes, Canvas Bags & Baskets
SIC 3498
Pr—K. Wilderotter
Sec—R. Wilderotter

KOLTON ELECTRIC MFG. CO.
135 N.J. Railroad Avenue
Newark, NJ, 07105
Phone: 201-344-4622
30,000 Sq. Ft.
Emp: 30
Office: M 3, F 3
Plant: M 24, F 0
Electric Transformers, Panelboards & Switchboards
SIC 36133, 36770
Partner—H. Kolton
Partner—C. Kolton
Ch/Eng—N. Plotkin

KONSTAN PLASTICS COMPANY
33 St. Francis Street
Newark, NJ, 07105
Phone: 201-589-6317
11,500 Sq. Ft.
Emp: 8
Office: M 2, F 0
Plant: M 6, F 0
Extrusion Of Thermoplastics, Rods, Tubes, Profiles, Special Shapes, Etc.
SIC 3079
Pr—A. Zyskowski

KOPPERS COMPANY, INC.
Organic Materials Div.
480 Frelinghuysen Ave.
Newark, NJ, 07114
Phone: 201-243-2000
90,000 Sq. Ft.
Emp: 67
Paints & Coatings
★SIC 28516
Pr—Douglas Grymes
S/M—R. F. Joscak
P/M—E. G. Flack

KREMENTZ & CO.
49 Chestnut Street
Newark, NJ, 07101
Phone: 201-621-8300
Emp: 325
◆Cufflinks, Earrings, Necklaces Etc.
SIC 3911
Ch/B—Walter M. Krementz, Jr.
Pr—Richard Krementz, Jr.
Exec/VP—E. Jadwin
VP—T. Fromme
VP—R. O. Linde
VP—R. Lanz
Sec—John M. Wollmer
Tr—T. Bonsignore
Comp—A. Carlson
O/M—J. Cronin
A/M—D. Foster
P/A—H. R. Hamhel
T/M—W. Ehlers
Pers/M—E. Van Tatarhove
P/M—J. B. Smits
P/Eng—J. Panelia
Branch Plants:
Providence, R.I.
Pleasantville, N.Y.

KROWNE METAL PRODUCTS CO., INC.
168 Emmet Street
Newark, NJ, 07114
Phone: 201-242-2468
Emp: 11
Sheet Metal Work Of Stainless Steel Bar Sinks, Used In Hotels, Retaurants, Clubs, Motels Etc.
SIC 3312
Pr—Nathan P. Krowne
VP—D. Edelman

L & H CORPORATION
144 South 14th Street
Newark, NJ, 07107
Phone: 484-7818
10,000 Sq. Ft.
Emp: 10
Screw Machine Products
SIC 3451
Pr—H. Gizzi
Tr—L. Gizzi

L-R METAL TREATING
Div Of: Thermo National Industries
108 Johnson St.
Newark, NJ, 07105
Phone: 589-3032
45,000 Sq. Ft.
Emp: 125
Heat Treating Of Metals, Brazing, Plating, Finishing
★SIC 3399
Pr—Herbert Dobkin
Exec/VP—Ben Betnick
VP—Donald Dobkin
VP—Phillip Cirelli
O/M—Clara Ferguson
P/A—B. Sisto
T/M—Raymond Rybinski
P/M—B. Orangio
P/Eng—Michael Rizzo
Plant:
South Plainfield, N.J.
Orange, Conn.

LACE CREATIONS, INC.
1448 Mccarter Highway
Newark, NJ, 07104
Phone: 201-481-2565
30,000 Sq. Ft.
Emp: 151
Office: M 3, F 4
Plant: M 62, F 32
▲Plastic Tablecloths
SIC 3079
Pr—Harry Berger
VP—H. Dersovitz
VP—Robert Dersovitz
Sec—J. Berger

LAFAYETTE MFG. CO.
274 Lafayette St.
Newark, NJ, 07105
Phone: 201-589-2135
Emp: 40
Womens Raincoats & Winter Jackets
SIC 2337
Pr—S. Tambascia
Sec—I. De Oliveira

LAMINATORS, INC.
100 Tiffany Blvd.
Newark, NJ, 07104
Phone: 201-482-4000
Emp: 15
Film Laminating To Paper
SIC 2641
Sec—B. Brown

LANCASTER CHEMICAL DIVISION
Div. Of: A Z S Corporation
660 Frelinghuysen Ave.
Newark, NJ, 07114
Phone: 201-242-2400
30,000 Sq. Ft. 5 Acres
Emp: 10
Office: M 5, F 1
Plant: M 4, F 0
Organic Surfactants, Surface Active Agents
★SIC 28430
Exec/VP—R.A. Paley
R/D—J. J. Patti
P/F—F. Lopresti

LAND MFG. CORP
9 St. Francis St.
Newark, NJ, 07105
Phone: 201-589-4136
Emp: 60
Raincoats & Outerwear Garments
SIC 2385
Pr—D. Landow

LANDEW & BLUME
190 Clifford St.
Newark, NJ, 07105
Phone: 201-344-5255
8,368 Sq. Ft.
Emp: 15
Wood Sawdust & Shavings
SIC 2421
Pr—Philip Blume
Ch/Ex/Off—Seymour Landew
Exec/VP—Selig Blume
Comp—Celon M. Hammer

LANDSBERG, E. INC.
66 Stockton St.
Newark, NJ, 07105
Phone: 201-589-6688
12,500 Sq. Ft. 0.75 Acres
Emp: 24
▲Calfskins & Sheepskins
SIC 3111
Pr—Ernest Landsberg
VP—David H. Whitlock
Sec—Abe Levy

LARTER & SONS
88 Parkhurst Street
Newark, NJ, 07114
Phone: 243-5510
Emp: 44
Cufflinks, Pins
SIC 3911
Ch/B—George A. Schuetz, Jr.
O/M—R. Davenport

LAUREL LAMP MFG. CO
111 Rome St.
Newark, NJ, 07105
Phone: 589-1148
Emp: 300
Residential Lighting
SIC 36457

LAWRENCE PACKAGING SUPPLY CORP.
113 N. 13th St.
Newark, NJ, 07107
Phone: 201-485-4400
Emp: 65
▲Various Types Of Packaging Materials
SIC 2642
Pr—John M. Robinson
VP—Max Fessler
VP—R. Vorisek
VP—Thomas Minogue
Comp—Lewis Schreider
G/M—John P. Robinson
O/M—Phil Pasqualone
P/M—Yosh Kanagawa

LEATHER FINISHERS, INC.
222 Verona Ave.
Newark, NJ, 07104
Phone: 201-481-0435
Emp: 18
Leather Finishing
SIC 3111
Pr—A. Cortiana

LECOURTENAY DIVISION
Goulds Pumps, Inc.
Ferry & Main Sts.
Newark, NJ, 07105
Phone: 201-589-2905
13,700 Sq. Ft. 1 Acres
Emp: 32
Office: M 7, F 1
Plant: M 24, F 0
▲Centrifugal Pumps
SIC 3561
Pr—D. A. Cantaulupo
Comp—M. Cummis
S/M—J. R. Beller
P/A—J. Senatore
P/M—J. J. Catlupe

LEE UNIFORM, INC.
33 William Street
Newark, NJ, 07102
Phone: 622-5700
Emp: 25
Policemen, Firemen, Industrial Uniforms
SIC 2311
Pr—Edward Shulman
Sec—Belle Shulman
S/M—George Tilton

LEONARD CO., INC., THE
1385 Mccarter Hwy.
Newark, NJ, 07104
Phone: 201-482-5373
50,000 Sq. Ft.
Emp: 40
◆Wood, Brass & Upholstered Beds
SIC 2511
Pr—Leonard Guzzino
Exec/VP—L. C. Guzzino
S/M—I. Gotkin

LEWMAR PAPER CO.
370 Adams St.
Newark, NJ, 07114
Phone: 201-589-2800
Paper-Book, Coated, Bond
SIC 2621
Pr—William L. Ostroff
Exec/VP—Harold Berson
Sec—Martin Ostroff

LIBERTY OPTICAL MFG. CO., INC.
380 Verona Avenue
Newark, NJ, 07104
Phone: 201-484-4100
60,000 Sq. Ft.
Emp: 125
Office: M 5, F 25
Plant: M 45, F 125
Eyeglass Frames (Plastic & Glass)
SIC 3851
Pr—Anthony S. Dichiara
Exec/VP—Anthony M. Dechiara
Tr—Frank Dichiara
Comp—Linus Weingart
G/M—Joseph G. Bianco
P/F—Philip Neckowitz
M/M—Fred Toman

LICHMAN, J. & SONS
241 Frelinghuysen Ave.
Newark, NJ, 07114
Phone: 201-243-3060
Emp: 15
Leather Tanning & Finishing For Shoes, Belts Etc.
SIC 3111
Pr—C. Lichman
VP—J. Lichman

LINDEN PACKING CO., INC.
324 Astor Street
Newark, NJ, 07114
Phone: 201-243-1930
Emp: 150
Abattoir
SIC 2011
Pr—M. Rosenberg
VP—J. Rosenberg

LINKER MACHINES, INC.
39 Division St.
Newark, NJ, 07102
Phone: 201-481-3700
23,000 Sq. Ft.
Emp: 19
Office: M 2, F 3
Plant: M 14, F 0
▲Food Products Machinery
★SIC 3551
Pr—V. B. Perkins
Sec—G. Davidson
O/M—M. Moore
P/A—S.M. Manca
P/M—L. B. Melanson

LISBON MANUFACTURING CO.
31 Clover St.
Newark, NJ, 07105
Phone: 201-344-1233
Emp: 35
Women's Wear
SIC 2337

LITTLE CHEF FOOD PRODUCTS, INC.
100 Sylvan Avenue
Newark, NJ, 07104
Phone: 482-7280
15,000 Sq. Ft.
Emp: 30
Frozen Foods (Pizza)
SIC 2038
Ch/B—Francis X. Ferrari
Pr—A. Palmeri
VP—F. Ferrari
O/M—P. Ronco

LUGGAGE AND NOVELTY MFG. CO.
49 Halsey St.
Newark, NJ, 07102
Phone: 201-623-3862
Emp: 9
Luggage
SIC 3161
Owner—H. Temkin

LUGGAGE GALLERY, THE
Sub. Of: Dayco Corp.
133 Kossuth St.
Newark, NJ, 07105
Phone: 201-589-7790
100,000 Sq. Ft.
Emp: 150
●Luggage & Business Cases
SIC 3161
G/M—W. Cudd

M & S KNITWEAR
620 Market Street
Newark, NJ, 07105
Phone: 201-344-8884
20,000 Sq. Ft.
Emp: 90
Women's & Misses' Pants Suits & Separates
SIC 2337
G/M—Nicholas Del Sordo

MAAS & WALDSTEIN CO.
2121 Mccarter Hwy.
Newark, NJ, 07104
Phone: 201-484-1600
100,000 Sq. Ft. 9 Acres
Emp: 125
◆Paints, Varnish, Lacquers
★SIC 28516
Pr—G. Klinkenstein
VP—M. S. Kaye
Tr—F. S. Magnus
O/M—G. Andrews
S/M—D. P. Volino
Branch Plant:
Chicago, Ill.

MACHINECRAFT CORP.
88 St. Francis St.
Newark, NJ, 07105
Phone: 201-344-4214
3,550 Sq. Ft.
Emp: 8
Machine Shop, Used Machinery
SIC 3599
Pr—D. Kasen

MACKMULL & GIL PRINTERS, INC.
236 Elm St.
Newark, NJ, 07105
Phone: 201-589-4562
Emp: 14
Offset & Letterpress Printing
SIC 2751
Pr—J. F. Gil
VP—E. D. Gil

MAGRUDER COLOR CO., INC.
1 Virginia Street
Newark, NJ, 07114
Phone: 242-1300
50,000 Sq. Ft.
Emp: 70
Office: M 1, F 4
Plant: M 65, F 0
◆Pigment Manufacturing
★SIC 28163
Ch/B—Joseph Weissgloss
Pr—Allan Weissglass
Exec/VP—John A. Howard
VP—Robert D. Van Soest
Sec—Marvin Weissglass
Mkt/Dir—B. Patterson
P/F—Carmen D'Alessio
S/D—Philip Flor
Ch/Eng—Gene Eskin

MAHLER, H. CO.
27 Haynes Ave.
Newark, NJ, 07114
Phone: 201-248-3344
7,500 Sq. Ft. 3 Acres
Emp: 8
Plant: M 2, F 6
●Industrial Wipers,, Safety Gloves Wiping Rags, Cheese Cloth
SIC 2299
Pr—Curt De Jonge
P/A—M. A. Greene
S/D—A. Rosa Weisshorn

MAIER, CHAS. E., INC.
123 Van Buren Street
Newark, NJ, 07105
Phone: 201-589-5173
Emp: 26
Signs, Displays, Blackboards, Bulletin Boards, Etc.
SIC 2499, 3281, 3993
Pr—Charles E. Maier
VP—Helen I. Maier
Sec—Edward L. Maier
O/M—M. Mcnabb

MALCOLM FOUNDRY CO.
67 Polk St.
Newark, NJ, 07105
Phone: 201-589-2408
8,000 Sq. Ft.
Emp: 47
Carbon & Stainless Steel Castings
SIC 3324
Pr—Mrs. John P. O'Neill
VP—John R. O'Neil

MANDAS AND ORR INC.
21-25 Brenner St.
Newark, NJ, 07108
Phone: 201-824-2050
30,000 Sq. Ft.
Emp: 36
Architectural Woodwork
SIC 2499
Pr—Kenneth Mandas
Sec—Leonard Orr
Comp—Milton Bernstein

MANHATTAN TOOL MFG. CO.
38 Van Buren St.
Newark, NJ, 07105
Phone: 201-589-8477
10,000 Sq. Ft.
Emp: 7
◆Blacksmith Tongs, Hammers, Marlin Spikes, Stone Drills Drift Pins, Bull Pins.
SIC 3423
Pr—Edward C. Domanski
Exec/VP—Al S. Domanski

MANNKRAFT CORP.
1000 U.S. Highway 1
Newark, NJ, 07114
Phone: 201-589-7400
Emp: 247
Corrugated Cartons, Containers, Point Of Purchase Displays
SIC 2653
Pr—Fredric R. Mann
VP—Irving Levine
Comp—Irving S. Rosen
S/M—Mark M. Scheck
P/M—Edward E. Bearman

MANTELL TRADING CO.
Wiping Rag Div.
P.O. Box 13, 1250 Mccarter Hwy.
Newark, NJ, 07101
Phone: 201-485-1010
5,000 Sq. Ft.
Emp: 8
Wiping Rags Non Woven Wipers Paper Wipers Cheesecloth Work Gloves
SIC 2211
Pr—Philip Tainow
VP—Harold Tainow
Sec—N.B. Tainow

MARA POLISHING & PLATING CO.
105 West Peddie St.
Newark, NJ, 07108
Phone: 201-242-0800
Emp: 7
Electroplating, Nickel, Citrome, Copper,, Brass, Antique Brass & Copper Polishing On All Metals
SIC 3471
Sec—G. Mara

MARLA SPORTSWEAR CO.
224 Sussex Ave.
Newark, NJ, 07103
Phone: 481-0450
Emp: 38
Ladies Rainwear
SIC 2385
Pr—S. Dubowsy
VP—Agnes Dubowsky
Sec—L. Dubowsky

MARO LEATHER CO.
825-831 Broadway
Newark, NJ, 07104
Phone: 482-1015
Emp: 17
Leather Finishing
SIC 3111
Pr—V. J. Amabile
VP—R. A. Amabile
Tr—J. J. Amabile

MARTIN INDUSTRIES, INC.
532 Mulberry St.
Newark, NJ, 07114
Phone: 243-7329
Emp: 26
Automatic Screw Machine Products
SIC 3452
Pr—John L. Martin
VP—Arthur L. Van Valkenburgh
Sec—Laura A. Martin

MATTIA PRINTING CO.
27-29 Park Av.
Newark, NJ, 07104
Phone: 201-482-5130
Emp: 17
Letterpress & Lithographic Printing
SIC 2751
Pr—Romeo Mattia

MAY, OTTO B., INC.
Sub. Of: Cone Mills Corp., N.C.
52 Amsterdam St.
Newark, NJ, 07105
Phone: 201-344-8444
340,000 Sq. Ft.
Emp: 65
Office: M 20, F 6
Plant: M 39, F 0
◆Chemicals And Dyes For Textile Use
SIC 28199
Pr—Dewey Trogdon
Exec/VP—R. S. Vetack
Tr—James T. Songster
Ch/Eng—R. J. Lehmann

MAYER, F. J. CORPORATION
Newark Polyethylene
29 E. Runyon St.
Newark, NJ, 07114
Phone: 201-243-8028
Emp: 30
Poly Bags, Packaging & Sanitary Products
SIC 2643
Pr—Edgar Eisler
Tr—Howard Reiss
O/M—K. Lazorchak

MAYFLOWER PACKAGING CO., INC.
129 Christie St.
Newark, NJ, 07105
Phone: 201-589-0276
20,000 Sq. Ft.
Emp: 15
●Folding Boxes
SIC 2651
Pr—S. Egert

MCCABE BOILER WORKS, INC.
488 Market St.
Newark, NJ, 07105
Phone: 201-589-0700
Emp: 10
Office: M 2, F 0
Plant: M 13, F 0
High Pressure Boiler Repair Mfg. Tanks & Smokestacks
SIC 3443
Ch/B—Henry J. Mccabe
VP—John M. Mccabe

MCCOURTS ALL AMERICAN SUPPLIERS INC.
25 Berkeley Ave.
Newark, NJ, 07104
Phone: 201-483-0693
Emp: 56
Office: M 3, F 1
Plant: M 2, F 50
School & Athletic Uniforms, Flags, Banners & Emblems
SIC 2339
Pr—Sue Spag Mccourt
VP—Robert E. Mccourt
Sec—M.H. Huff

MCNEIL CONSTRUCTION CO., INC.
17 Herbert Pl.
Newark, NJ, 07104
Phone: 201-482-3814
Emp: 35
Office: M 34, F 1
Refractories Contractors
SIC
Pr—S. Higgins, Jr.
VP—J. Barry, Jr.
Sec—T. A. Daley

MECHANIC
96 Monroe
Newark, NJ
Phone: 201
Emp:
Screw Mact
SIC 3451
Pr—Leonar
Ch/Ex/Off—
Sec—Estell

MELINDA F
65 Mc Wh
Newark, N.
Phone: 20
Emp:
Women's A
SIC 2335
Pr—Melvin

MERCER PI
1 Jabez St
Newark, N
Phone: 58
70,000 Sc
Emp
▲Vinyl Floor
SIC 3996
Pr—Eric F.
P/A—Mart
P/M—Pete

MERIT ENT
140 Thom
Newark, N
Phone: 24
Emp
Small Elec
SIC 3634
Pr—P. Fin
Exec/VP—
Comp—D.

MERIT TOI
387 So. 1
Newark, N
Phone: 2C
Emp
Automobil
SIC 3714
Pr—J. Art

METAL FIN
410 Freli
Newark, N
Phone: 2C
10,000 S
Emp
Offi
Pla
Barrel Fin
& Media
SIC 3471
Pr—Arnol

METAL PA
INC.
165 Dela
Newark,
Phone: 2
15,800 S
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Tumbling
Deburrin
SIC 3555
Pr—Arthu
Exec/VP-
Sec—Fra
S/M—Be

METAL RI
192 Mul
Newark,
Phone: 2
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Choppin
SIC 334
Pr—Hert

METROPO
45 Halle
Newark,
Phone: 2
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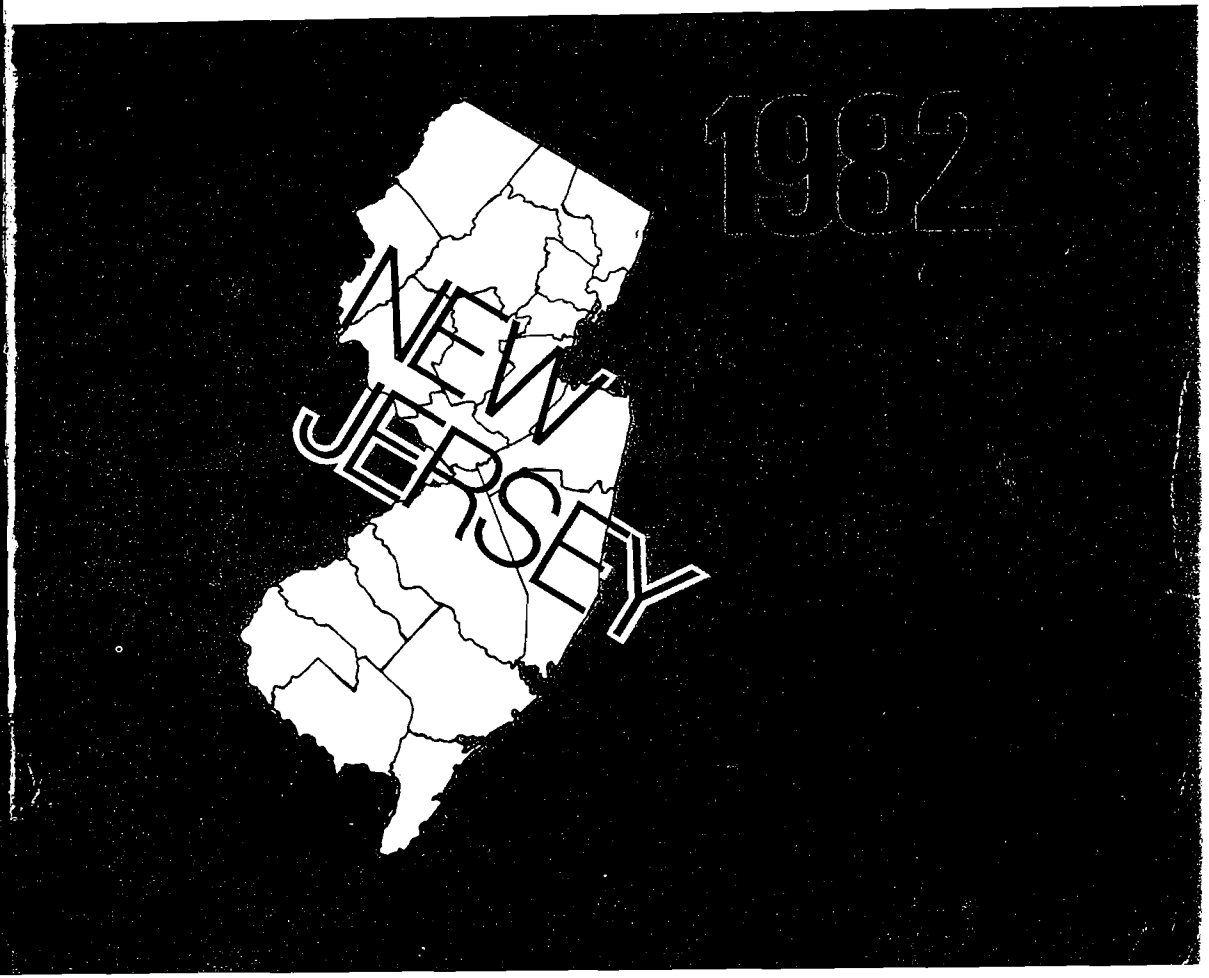
SIC 239
Pr—Mor

MacRAE'S

NEW JERSEY STATE INDUSTRIAL DIRECTORY



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Poles

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RS INC.
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7100
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LAYS INC.
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344-5231
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$1,000,000 Est. 1925
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Johnston, Jr.

Bank:
F N S B Of N.J.

KAY CEE INC.
50 Columbus St.
Newark, NJ 07102
Phone: 201-642-7504
Womens Accessories
SIC 2252, 2253
Pr—J. Casha

KAY SPRING INC.
Div. Of: Spring Inc.
750 Frelinghuysen Ave.
Newark, NJ 07114
Phone: 201-248-4270
Sales: $5,000,000 To $10,000,000
84,000 Sq. Ft.
Emp: 126
Office: M 0, F 4
Plant: M 70, F 30
▲Furniture & Bedding Springs
SIC 2515
S/M—Don Flaum
Pers/M—Mike Folk
P/M—Lloyd Marshall
Main Office:
175 Eileen Way
Syosset, N.Y. 11791

KEIM PRINTING CO.
508 N. 11th St.
Newark, NJ 07107
Phone: 201-482-4422
Emp: 50
Printing
SIC 2751
Pr—Joe Scrafino

KELLER, LEO
296 Adams St.
Newark, NJ 07102
Phone: 201-589-2252
Emp: 45
Franfurters, Bologna, Pastrami Etc.
SIC 2013
Qwner—Leo Keller

KENNY PRESS INC., THE
110 Edison Pl.
Newark, NJ 07102
Phone: 201-642-3111
Sales: $1,000,000 To $5,000,000
Emp: 60
Commercial Printing
SIC 2751
Pr—William T. Kenny
Exec/VP—John F. Kenny
G/M—Daniel D. O'Connell
S/M—T. Kenny
P/A—Mark Kenny

KESTER SOLDER DIVISION
Div. Of: Litton System Inc.
88 Ferguson St.
Newark, NJ 07105
Phone: 201-589-0246
Solder & Fluxes
Emp: 38
▲Solder Wire (Paste Solder), Solder Bar, Soldering Flux & Thinner Removers
SIC 3356
Pr—L. D. Kramer
VP—D. Bernler
VP—M. I. Haraburd
Comp—R. Sokolowski
G/M—John Blakeley
O/M—T. Conroy
S/M—J. Claus
R/D—J. Feinberg
Branch Plants:
Chicago
Anaheim
Canada

KEYSTONE CORP.
24 Legal St.
Newark, NJ 07114
Phone: 201-248-1665
Sales: $1,000,000 To $5,000,000
30,000 Sq. Ft.
Emp: 45
Automobile Bumpers, & Body Shop Supplies
SIC 3465, 3714
Pr—John Jordan
VP—Al Ronco
O/M—Mary Delaney
S/M—Pete Johnson
P/F—Vic Villilata

KEYSTONE FOLDING BOX CO.
367-381 Verona Ave.
Newark, NJ 07104
Phone: 201-483-1054
Sales: $1,000,000 To $5,000,000
100,000 Sq. Ft.
Emp: 81
Office: M 16, F 8
Plant: M 53, F 4
Folding Paper Boxes
SIC 2651
Ch/B—George E. Blindt
Pr—Harold E. Hartman
VP—Harold E. Hartman, Jr.
Sec—Edward B. Gavin
S/M—Robert S. Abeles
P/A—Edward Regula

KINGSLAND DRUM & BARREL CO.
Earle Enterprises Div.
308 Miller St.
Newark, NJ 07114
Phone: 201-242-1203
Emp: 10
General Industrial Machinery
SIC 3569

KOCH CARBONIC CORP.
433 Raymond Blvd.
Newark, NJ 07105
Phone: 201-991-8424
Emp: 25
Office: M 3, F 3
Plant: M 19, F 0
Carbon Dioxide Gas & Dry Ice
SIC 2813
Pr—J. P. Walsh
VP—T. F. Gallagher
P/M—G. Kiltey

KOHLER DELICATESSEN MEATS INC.
Div. Of: Freda Corp.
57 Napoleon St.
Newark, NJ 07105
Phone: 201-589-3459
Sales: $1,000,000 To $5,000,000
33,000 Sq. Ft.
Emp: 40
Office: M 1, F 3
Plant: M 33, F 3
Hams & Bologna Products
SIC 2013
Ch/B—D. Giuffrida
Pr—J. Giuffrida
Exec/VP—S. Giuffrida
VP—M. Giuffrida
Comp—R. Mitchell

KOLB SHEET METAL
172 Pennsylvania Ave.
Newark, NJ 07114
Phone: 201-243-3575
Sales: Up To $1,000,000 Est. 1908
19,000 Sq. Ft.
Emp: 20
▲Air Pollution Control Equipment, Sheet Metal Work
SIC 3564, 3444
Pr—Norman Kolb
VP—D. A. Kolb
Tr—J. A. Miano
G/M—H. O. Guendner
P/A—W. Cartmill
P/F—L. Szasz
M/M—E. Brown

KOLLER, E. L. MFG & COAL CHUTE CO., INC.
94-96 First St.
Newark, NJ 07107
Phone: 201-483-0333
Sales: Up To $1,000,000 Est. 1918
15,000 Sq. Ft. 2 Acres
Emp: 6
Concrete Pouring Chutes, Canvas Bags & Baskets
SIC 3498, 2393
Pr—K. Wilderotter
Sec—R. Wilderotter
Bank:
First National State Bank Of New Jersey

● Importers ◆ Exporters & Importers ★ Research Facilities

KONSTAN PLASTICS CO., INC.
33 St. Francis St.
Newark, NJ 07105
Phone: 201-589-6317
Sales: Up To $1,000,000 Est. 1953
11,500 Sq. Ft.
Emp: 11
Office: M 2, F 1
Plant: M 6, F 2
Extrusion Of Thermoplastics, Rods, Tubes, Profiles, Special Shapes, Etc.
SIC 3079
Pr—A. E. Zyskowski
Tr—Sec-L. M. Zyskowski

KOPPERS CO., INC.
Organic Materials Div.
480 Frelinghuysen Ave.
Newark, NJ 07114
Phone: 201-243-2000
Sales: $1,000,000 To $5,000,000
90,000 Sq. Ft.
Emp: 67
▲Paints & Coatings
★SIC 2851
S/M—Frank B. Henriques
P/M—E. G. Flack

KORENSTEIN, HOWARD SPORTSWEAR INC.
236 South St.
Newark, NJ 07114
Phone: 201-589-1616
Emp: 27
Childrens & Ladies Garments
SIC 2253
Owner—Howard Korenstein

KREMENTZ & CO.
49 Chestnut St.
Newark, NJ 07101
Phone: 201-621-8300
Sales: Over $10,000,000
Emp: 400
◆Cufflinks, Earrings, Necklaces Etc.
SIC 3911
Ch/B—Walter M. Krementz, Jr.
Pr—Richard Krementz, Jr.
Exec/VP—E. Jadwin
VP—T. Fromme
VP—R. O. Linck
VP—R. Lanz
Tr—Sec-T. Bonsignore
Comp—A. Penabad
O/M—J. Cronin
A/M—D. Foster
P/A—H. R. Hambel
T/M—W. Ehlers
Pers/M—G. R. Danelson
P/M—J. Broom Smith
P/Eng—J. Panela
Branch Plants:
Providence, R.I.
Pleasantville, N.Y.

KROWNE METAL CORP.
45 Hamilton St.
Newark, NJ 07102
Phone: 201-242-2468
Sales: Up To $1,000,000
Emp: 16
Office: M 1, F 2
Plant: M 13, F 0
▲Sheet Metal Work Of Stainless Steel Bar Sinks, Used In Hotels, Retaurants, Clubs, Motels Etc.
SIC 3312, 3449
Pr—Peter H. Miller
VP—Robert S. Forman
O/M—Ruth Mc Allndin

L & H CORP.
144 S 14th St.
Newark, NJ 07107
Phone: 201-484-7818
Sales: Up To $1,000,000
10,000 Sq. Ft.
Emp: 15
Screw Machine Products
SIC 3451
Pr—H. Gizzi
Tr—L. Gizzi

L-R METAL TREATING
Div Of: Thermo National Industries
108 Johnson St.
Newark, NJ 07105
Phone: 201-589-3032
Sales: $5,000,000 To $10,000,000
55,000 Sq. Ft.
Emp: 125
Heat Treating Of Metals, Brazing, Plating, Finishing
★SIC 3398, 3471
Pr—Herbert Dobkin
Exec/VP—Ben Belnick
VP—Donald Dobkin
VP—Anodizing-Philip Cirellii
VP—Engr-Daniel Mutter
VP—Plating/Finishing-William Foster
O/M—Clara Ferguson
P/A—Irving Trachman
T/M—Raymond Rybinski
P/M—B. Orangio
Branches:
South Plainfield, N.J.
Orange, Conn
Farmingdale, N.Y.

LA CROSS
Div. Of: Del Laboratories Inc.
680 S 17th Street
Newark, NJ 07103
Phone: 201-373-1566
Sales: Over $10,000,000
Emp: 225
●Manicure Instruments
SIC 3841
Pr—Dan Wassong
G/M—Carroll Lord
Branch Plant:
Farmingdale, Ny.

LACE CREATIONS INC.
1448 Mc Carter Hwy.
Newark, NJ 07104
Phone: 201-481-2565
Sales: Over $10,000,000 Est. 1972
30,000 Sq. Ft.
Emp: 151
Office: M 3, F 10
Plant: M 62, F 76
▲Plastic Tablecloths
SIC 3079
Pr—Harry Berger
VP—H. Dersovitz

LAFAYETTE MFG. CO.
Cosmo Fashions
407 Mulberry St.
Newark, NJ 07102
Phone: 201-643-4553
7,500 Sq. Ft.
Emp: 40
Office: M 1, F 1
Plant: M 1, F 37
Womens Raincoats & Winter Jackets
SIC 2385, 2337
Pr—Salvatore Tambascia
Sec—I. De Oliveira

LAMINATORS INC.
100 Tiffany Blvd.
Newark, NJ 07104
Phone: 201-482-4000
Emp: 15
Film Laminating To Paper
SIC 2641
Sec—Emily

LANCASTER CHEMICAL DIV.
Div. Of: A Z S Corp.
660 Frelinghuysen Ave.
Newark, NJ 07114
Phone: 201-242-2400
Sales: Up To $1,000,000
30,000 Sq. Ft. 5 Acres
Emp: 15
Office: M 8, F 3
Plant: M 8, F 0
◆Org. Surfactants,Surface Active Agents:Polyester,Epoxy,& Urethane Resins,Asphalt Additives & Agents
★SIC 2843, 2821, 2952
G/M—Dale E. Battin
S/M—R. A. Paley
P/F—F. Lopresti

LANDEW & BLUME INC.
190 Clifford St.
Newark, NJ 07105
Phone: 201-344-5255
Sales: Up To $1,000,000
8,368 Sq. Ft.
Emp: 15
Wood Sawdust & Shavings
SIC 2421
Pr—Philip Blume
Exec/VP—Selig Blume
Tr—Sec-Seymour Landew

LANDSBERG, E. INC.
66 Stockton St.
Newark, NJ 07105
Phone: 201-589-6688
Sales: Up To $1,000,000
12,500 Sq. Ft. 75 Acres
Emp: 20
▲Calfskins & Sheepskins
SIC 3111
Pr—Ernest Landsberg
VP—David H. Whitlock
Sec—Abe Levy

LARTER & SONS
88 Parkhurst St.
Newark, NJ 07114
Phone: 201-243-5510
Emp: 44
Cufflinks, Pins
SIC 3911
Ch/B—George A. Schuetz, Jr.
O/M—R. Davenport

LAUREL LAMP MFG. CO
111 Rome St.
Newark, NJ 07105
Phone: 201-589-1148
Sales: Over $10,000,000
Emp: 300
Residential Lighting
SIC 3645

LAWRENCE PACKAGING SUPPLY CORP.
113 N 13th St.
Newark, NJ 07107
Phone: 201-485-4400
Sales: $1,000,000 To $5,000,000
Emp: 65
▲Packaging Mat'ls,Press, Sensitive Envelopes,Polyethylene Bags,Press,Sensitive Data Processing Labels
SIC 2642, 2641, 2392
Pr—John M. Robinson
VP—Thomas Minogue
VP—Max Fessler
VP—Mkt-Robert Downing
Comp—Lewis Schreider
G/M—John P. Robinson
S/M—Phil Pasqualone
Mkt/Dir—Marty Cohn
P/R—Cust/Serv-Glenn Maletich
P/M—Yosh Kanagawa
Branches:
6823 Watcher St.
City Of Commerce, Cal. 90040
213-722-2033
6300 Brookville Rd., Unit 8
Indianapolis, Ind. 46219
317-353-9313

LEATHER HANDLE MFG. CO.
44 Dickerson St.
Newark, NJ 07103
Phone: 201-485-2866
Leather Handles
SIC 3199

LEE FASHIONS INC.
9 St. Francis St.
Newark, NJ 07105
Phone: 201-344-3323
Sales: $1,000,000 To $5,000,000
Emp: 45
Ladies & Childrens Outerwear
SIC 2253
Pr—Victor Delduca

LEE UNIFORM, INC.
33 William St.
Newark, NJ 07102
Phone: 201-622-5700
Emp: 25
Policemen, Firemen, Industrial Uniforms
SIC 2311
Pr—Edward Shulman
Sec—Belle Shulman
S/M—George Tilton

LEONACE BAG & IMPORT CORP.
327 Dration St.
Newark, NJ 07104
Phone: 201-481-4442
Emp: 40
Textile Products
SIC 3552
Pr—Isaac Rubin

LEONARD CO., INC., THE
1685 Mc Carter Hwy.
Newark, NJ 07104
Phone: 201-482-5373
Sales: $1,000,000 To $5,000,000
Est. 1950
50,000 Sq. Ft.
Emp: 40
◆Wood, Brass & Upholstered Beds
SIC 2512, 2514
Pr—L. C. Guzzino
Sec—N. Guzzino
S/M—I. Gotkin
Bank:
First Jersey National Bank
Harrison, N.J.

LEWMAR PAPER CO.
370 Adams St.
Newark, NJ 07114
Phone: 201-589-2800
Paper-Book, Coated, Bond
SIC 2621
Pr—William L. Ostroff
Exec/VP—Harold Berson
Sec—Martin Ostroff

LIBERTY OPTICAL MFG. CO., INC.
380 Verona Avenue
Newark, NJ 07104
Phone: 201-484-4100
60,000 Sq. Ft.
Emp: 125
Office: M 5, F 25
Plant: M 45, F 125
Eyeglass Frames (Plastic & Glass)
SIC 3851
Pr—Anthony S. Dichiara
Exec/VP—Anthony M. Dechiara
Tr—Frank Dichiara
Comp—Linus Weingert
G/M—Joseph G. Bianco
P/F—Philip Neckowitz
M/M—Fred Toman

LILLIE PRETZEL CO., INC.
271 S. 6th St. P.O. Box 3127
Newark, NJ 07100
Phone: 201-624-3350
Sales: $1,000,000 To $5,000,000
15,000 Sq. Ft.
Emp: 37
Office: M 6, F 3
Plant: M 19, F 14
▲Soft Pretzels
SIC 2052
Pr—Anthohy Lombardi
Ch/Ex/Off—Michael Lombardi
VP—Salvatore Lombardino
G/M—Charles Anello

LINDEN PACKING CO., INC.
324 Astor Street
Newark, NJ 07114
Phone: 201-243-1930
Emp: 150
Abattoir
SIC 2011
Pr—M. Rosenberg
VP—J. Rosenberg

LINDEN PROVISION CO., INC.
146-154 Christie St.
Newark, NJ 07105
Phone: 201-589-5634
10,000 Sq. Ft.
Emp: 20
Prepared Meat Products
SIC 2013
S/M—Gary Kepness

LINKER MACHINES INC.
39 Division St.
Newark, NJ 07102
Phone: 201-481-3700
Sales: $1,000,000 To $5,000,000
23,000 Sq. Ft.
Emp: 19
Office: M 2, F 3
Plant: M 14, F 0
▲Food Products Machinery
★SIC 3551
Pr—V. B. Perkins
Sec—G. Davidson
O/M—M. Moore
Bank:

▲ Exporters ● Importers ◆ Exporters & Importers ★ Research Facilities

FILE

4/22/85

WITCO CHEMICAL — NEWARK

MARIO:

THE FOLLOWING WAS SUBMITTED ON THE MONITORING REPORT FOR THE PERIOD 1/1/85 TO 3/31/85

HARRY

CHLORINATED ORGANICS PPB

	DATE	PPB	DATE	PPB
2 DICHLOROETHANE	1/9	527	3/6	22.7
2 DICHLOROPROPANE	1/9	7.45	3/6	0
TRICHLOROETHYLENE	1/9	0.16	3/6	0
1,2 TRICHLOROETHANE	1/9	4.83	3/6	0
1,22 TETRACHLOROETHANE	1/9	1.68	3/6	0
1,2 DICHLOROBENZENE	1/9	0	3/6	22.8
TETRACHLOROETHYLENE	1/9	0	3/6	2.8
IDENTIFIED VOL. ORG.	1/9	0	3/6	32.6
PBB	1/9	NDLT 0.49		
PBBO's	1/9	.129		

190-5341

WHITE CHEMICAL CORPORATION
660 FRELINGHUYSEN AVENUE, NEWARK, N.J. 07114
P.O. BOX 2500
TELEPHONE 201-621-4100
TELEFAX 201-621-7096
TELEX 84 41 31

June 17th, 1988

Mr. Vincent Olivio
Passaic Valley Sewerage Commission
600 Wilson Avenue
Newark, New Jersey 07105

Dear Mr. Olivio:

As per our telephone conversation of today, enclosed please find a site map indicating the location of present and proposed water meters and also pin-pointing the location of our current sampling points.

Please note that the main water meter readings, minus the readings obtained from the water meter in Bldg. 34 and the proposed water meter for Bldg. 35, will give us the flow for Bldg. 33.

If I may be of any further assistance, please do not hesitate to call.

Very truly yours,

WHITE CHEMICAL CORPORATION

Steven L. Shopsis
Plant Manager

SLS/nx
Eng. 1988
JUN
RECEIVED

BAE 000007

FRELINGHUYSEN AVENUE

FROM

MAIN WATER METER
□ OFF-SITE

WATER SAMPLING
BLDG 33
OUTLET #2

OUTLET #3
METER TO BE ADDED FOR TOILETS
PER JIM FISHER
PHONE CONVERSATION 7/7/88

PH EQPT.
TOILETS
BLDG. 33.

A B C D

FENCE

PROPOSED
WATER METER
BLDG 35
(SANITARY)
(ONLY)

BLDG. 35.
LUNCH ROOM,
TOILETS & LOCKER
ROOMS
2 FLOORS

OUTLET #4

WATER SAMPLING
BLDG 34
OUTLET #1

WATER METER
BLDG. 34

PH & LEL
EQPT.

BLDG. 34.

E F G S Y T Z U AA H J M I V K X N Q N CC I L O K X BB

MAINTENANCE
SHOP

NO WATER
OR
DRAINS.

7/7/88
PER PHONE CONVERSATION
JIM FISHER

STORE HOUSE
NO WATER
OR
DRAINS

DD
EE

FENCE

FENCE

WHITE CHEMICAL Corp.
660 FRELINGHUYSEN AVE., NEWARK.

TFB 042668

TFB

RR SIDING & FENCE INTER-FERING WITH BLDG CONST. SHALL BE REMOVED.

MATI TES LAB

PLATFORM

FOUNDRY BUILDING

Bldg. 34

Outlet #1

EXISTING FENCE

LUNCH & LOCKER Bldg. 35

EXISTING RR SIDING

Water meter to be installed

55'-10

5'-0

8" C.I.

12'-0

SANITARY Sewer

TANK

BLDG. Nº 33

8" C.I. SEWER

36'-0

TANK

TANK

BLDG Nº 13

SANITARY Sewer

Outlet #2

BLDG. Nº 32

BLDG. Nº 11

BLDG. Nº 30

9" C.I. SEWER

6½" I.

BLDG Nº 19

BLDG Nº 5

BLDG. Nº 6

BLDG. Nº 20

BLDG. Nº 18

BLDG. Nº 7

BLDG Nº 3

FENCE & PROPERTY LINE

DIS, 80

PRELINGHUYSEN AVENUE

600.0'

		DATE
C	REVISED ELEV. SHAFT, LOCATION OF NEW PLATFORM & ADJACENT GRADES. JOB 57-2	11/57
D	REVISED LOCATION OF PLATFORM. JOB 57-2	12/57

PLOT PLAN

SCALE 1" = 50'-0

Expires 7/88

Exp 7/88

PASSAIC VALLEY SEWERAGE COMMISSIONERS
APPLICATION FOR A SEWER CONNECTION PERMIT

Three outlets

SECTION A

NO-461

1. **Company Name:** WHITE CHEMICAL CORPORATION

2. **Permit number if applicable,** 21404460

3. **Location:** 660 Frelinghuysen Avenue

   Newark, New Jersey **Zip Code:** 07114

4. **Mailing Address:** P. O. Box 2500

   Newark, New Jersey **Zip Code:** 07114

5. **Person to contact concerning information provided in this application:**

   Name of Contact Official: Steven L. Shopsis

   Title: Plant Manager **Phone No.** 621-4100

   Address: P. O. Box 2500, Newark, New Jersey **Zip Code** 07114

6. **Number of Employees - Full Time:** 73 **Part Time:** 1

   Number of Work Days Per Year: 260

   Number of Shifts Per Day: 3

7. **If property is owned indicate block and lot numbers:**

   VOID

   Assessed Value: **19**

8. **If property is rented indicate name and address of owner:**

   AZS Corporation

   Suite 190, 6201 Power Ferry Road, Atlanta, Georgia 30339

   Total square feet rented: 5 Acres

9. **List NJPDES Permit number if applicable,** N/A and

   name of receiving body of water entered

FEB 1988 RECEIVED

BAE 000009

SECTION B

WATER DATA

10. Water Source: (Circle all appropriate answers)

Purchased	(Y) - N		
Well	Y - (N)	If Y, is it metered	Y - N
River	Y - (N)	If Y, is it metered	Y - N

11. Name of purchased water supplier: Newark Water Supply

List all Acct #s: 05748812000

12. Water Received: From Mo. 1 Yr. 87 Through Mo. 1 Yr. 88 (Present)

(* Next to a figure means it is estimated).

	PURCHASED	WELL	RIVER	TOTAL
1st Qtr.	6,383,477	0	0	6,383,477
2nd Qtr.	6,294,412	0	0	6,294,412
3rd Qtr.	6,219,200	0	0	6,219,200
4th Qtr.	6,573,611	0	0	6,573,611

GRAND TOTAL 25,470,700

Report in gallons

13. Water Use and Disposition (* Next to a figure means it is estimated).

	Gallons Sanitary/Combined Sewer	Discharged Stormsewer/ River/Ditch	Gallons Used Other
Sanitary Service Only	500,000*	0	
Process Waste Water	1,000,000*		
Cooling Water	20,000,000*		
Evaporation			1,000,000*
Contained in the product			3,000,000*
Other (Describe)			

GRAND TOTAL 25,5000,000*

SECTION B (CONTINUED)

14. **Process wastewater which is discharged as above is metered as follows:**

to the Separate Sanitary Sewer	Y - (N)
to the Combined Sewer	Y - (N)
to a storm sewer	Y - (N)
river or ditch	Y - (N)

15. **Waste Hauler Information: List all firms and/or independent contractors used to remove process waste or sludge from this facility.**

Contractor	Address	Icc #	Waste type handled
SCA Chemical Ser.	Model City, N. Y.		Corr., Flam.
Del.Container Corp.	Coatesville, Pa.		Corr., Flam.
Chem.Waste Mgt.	Emille, Ala.		Corr., Flam.

SECTION C

OPERATIONAL CHARACTERISTICS

16. **Discharge of Industrial Waste is continuous** Yes

or intermittent _____ **each operating day.**

If the discharge is intermittent, it occurs between the following hours: _____

17. **Brief description of Manufacturing or other activity performed:** Organic Chemical manufacture incorporating reactions, distillations, mixing and blending.

18. **Principal Raw Materials used:** Bromine, chlorine, phosphorous trichloride, organic fatty acids, dichloroethane, diphenyl oxide, antimony oxide.

19. **Principal Products or Services:** Decabromo diphenyl oxide, acid chlorides, alkyl bromides, proprietary flame retardant mixtures.

SECTION E

ANALYSIS OF INDUSTRIAL WASTE

26. Analysis for Industrial Waste must be a proper sample taken for each outlet.

OUTLET NO. 1 & 2 combined

Report to the nearest unit: XX. except where indicated with (1) Example: 15 mg/l				Report to the nearest hundredth: 0.XX except where indicated Example: 0.36 mg/l			
Code		Parameter	Value	Code	Parameter	Value
0200*		Radioactivity (PL-1)		1097*	Antimony (Sb)	0.10
0500		Total Solids	154	1002*	Arsenic (As)	
0510		Total Mineral Solids	102	1022*	Boron (B)	
0530		Total Suspended Solids	6.0	1027*	Cadmium (Cd)	
0552		Mineral Suspended Solids	3.0	1034*	Chromium Total (Cr)	
0555	(1)(3)	Petroleum Hydrocarbons	<1.0	1042*	Copper (Cu)	
0310		Biochemical Oxygen Demand (BOD)	3.0	1045*	Iron (Fe)	0.04
				1051*	Lead (Pb)	
0340		Chemical Oxygen Demand (COD)	11.0	0720*(3)	Cyanide (CN)	
				1900*	Mercury(Report to 0.XXX)	
0680		Total Organic Carbon (TOC)	5.93	1067*	Nickel (Ni)	<0.03
				1147*	Selenium (Se)	
0745*	(1)	Sulfide	<1.0	1077*	Silver (Ag)	
9000	(1)(3)	pH (standard unit range)	7.72	1102*	Tin (Sn)	
0625*	(1)	Kjeldahl N as N	<0.1	1092*	Zinc (Zn)	
0610*	(1)	Ammonia as N	<0.1	2730*	Phenol	0.002
0507*	(1)	Ortho Phosphates as P	0.20	4053*	Pesticides (Report to 0.XXX)	
9998*	(2)(3)	TTO (Report to 0.XXX)				
				9999(2)(3)	TTVO(Report to 0.XXX)	See Attached

FOOTNOTES:

(1) Report results to the neareth tenth, i.e., 1.6 mg/l.

(*) Analyze for this if reasonably expected to be present in the discharge.

(2) See instructions.

(3) Grab sample required.

SECTION E (CONTINUED)

Samples collected by: White Chemical, James Fisher

Date: 12/1/87

Samples analyzed by: Garden State Laboratories, Inc.

Travelers Ins. Co. Envir. Labs **Date:** 12/6

Products being manufactured when sample was collected: Pivaloyl Chloride, Hydriodic Acid, Capryloyl Chloride, Decabromo-diphenyl oxide

27. **Who performs the analysis of the samples for User Charge?** Garden State Labs, Travelers Ins. Co. Environmental Labs.

28. **Is the Laboratory certified by NJDEP to conduct all the analyses? Y - N** Y

29. **Who performs the analyses of the samples for the pretreatment parameters?** None

(If monitoring has not commenced for pretreatment, indicate laboratory you plan to use. If unknown, so state): None

30. **Is The Laboratory certified by NJDEP to conduct all the required Pretreatment analyses?**

Y - N None

31. **Based upon knowledge of materials and processes used at this facility check the approprite box that best describes the potential that a Priority Pollutant, listed on Tables 1, 2, & 3 is present in your discharge.**

SECTION F

PRETREATMENT

32. Industrial Category: _____

Subpart (s): _____

33. Compliance date(s): _____

34. Date Baseline Monitoring Report (BMR) submitted to PVSC: _____

35. Compliance schedule submitted? _____

If yes is facility on schedule? _____ Explain if compliance date will not be met:

36. Does this facility come under the Resource Conservation and Recovery Act (RCRA)?

Yes

37. Does this facility have a Spill Prevention Control and Countermeasures (SPCC) plan?

Yes

If yes, describe: We have a 6,000 gallon oil storage tank for our boilers. The tank is on concrete with a suitable containment (dike).

38. Has this facility ever been cited by NJDEP or EPA for a violation of State or Federal Regulations for the nature of its wastewater discharge? Y - (N) _____

CERTIFICATION:

The information contained in this application is familiar to me and, to the best of my knowledge and belief, such information is true, complete, and accurate.

If the applicant is a corporation, a corporate resolution is attached granting me the authority to sign the application on behalf of the corporation.

Name of signing official: Steven L. Shopsis
PRINT

TITLE: Plant Manager

1/29/88
DATE

Steven L Shopsis
SIGNATURE

TABLE 1 EPA PRIORITY POLLUTANTS

CHECK APPROPRIATE BOX

NAME	A	B	C	D		A	B	C
acenaphthene			X		2,4 dimethylphenol			X
acrolein			X		2,4 dinitrotoluene			X
acrylonitrile			X		2,6 dinitrotoluene			X
benzene			X		1,2 diphenylhydrazine			X
benzidine			X		ethylbenzene			X
carbon tetrachloride			X		fluoranthene			X
(tetrachloromethane)					4-chlorophenyl phenyl ether			X
chlorobenzene			X		4-bromophenyl phenyl ether			X
1,2,4-trichlorobenzene			X		bis(2-cloroisopropyl) ether			X
hexachlorobenzene			X		bis(2-chloroethoxy) methane			X
1,2 dichloroethane	X				methylene chloride			
1,1,1, trichlorethane				X	(dichloromethane)			
hexachloroethane				X	methyl chloride			X
1,1, dichloroethane				X	(chloromethane)			
1,1,2 trichloroethane				X	methyl bromide			X
1,1,2,2, tetrachloroethane		X			(bromomethane)			
chlorethane				X	bromoform(tribromomethane)			X
bis(chloromethyl) ether			X		dichlorobromomethane			X
bis(2 chloroethyl) ether			X		trichlorofluoromethane			X
2-chloroethyl vinyl ether (mixed)			X		dichlorodifuoromethane			X
2-chloronaphthalene			X		chlorodibromomethane			X
2,4,6, trichlorophenol			X		hexachlorobutadiene			X
parachlorometa cresol			X		hexachlorocyclopentadiene			X
chloroform (trichloromethane)			X		isophorone			X
2 chlorophenol			X		naphthalene			X
1,2, dichlorobenzene			X		nitrobenzene			X
1,3, dichlorobenzene			X		2-nitrophenol			X
1,4, dichlorobenzene			X		4-nitrophenol			X
3,3, dichlorobenzidine			X		2,4-dinitrophenol			X
1,1, dichloroethylene			X		4,6 dinitro-o cresol			X
1,2, trans-dichloroethylene			X		N-nitrosodimethylamine			X
2,4, dichlorophenol			X		N-nitrosodiphenylamine			X
1,2, dichloropropane			X		N-nitrosodi-n-proplyamine			X
1,3 dichloropropylene			X		pentachlorophenol			X
(1,3 dichloropropene)			X		phenol			X

A. KNOWN TO BE PRESENT
B. SUSPECTED TO BE PRESENT
C. KNOWN TO BE ABSENT
D. SUSPECTED TO BE ABSENT

TABLE 1 EPA PRIORITY POLLUTANTS (CONTINUED)

CHECK APPROPRIATE BOX

NAME	A	B	C	D		A	B	C	D
bis(2-ethlhexyl) phthalate			X		endrin			X	
butylbenzylphthalate			X		endrin aldahyde			X	
di-n-butylphthalate			X		heptachlor			X	
di-n-octylphthalate			X		heptachlor (epoxide)			X	
diethylphthalate			X		BHC Alpha			X	
dimethylphthalate			X		BHC Beta			X	
benzo(a)anthracene			X		BHC Gamma			X	
benzo(a)pyrene			X		BHC Delta			X	
3,4 benzofluoranthene			X		PCB-1242			X	
benzo(k)fluoranthane			X		PCB-1254			X	
chrysene			X		PCB-1221			X	
acenaphthylene			X		PCB-1232			X	
anthracene			X		PCB-1248			X	
benzo(ghi)perylene			X		PCB-1260			X	
fluorene			X		PCB-1016			X	
phenanthrene			X		toxaphene			X	
dibenzo(a,h)anthracene			X		antimony (total)	X			
indeno(1,2,3-c,d)pyrene			X		arsenic (total)			X	
pyrene			X		asbestos (fibrous)			X	
tetrachloroethylene				X	beryllium (total)			X	
toluene			X		cadmium (total)			X	
trichloroethylene				X	chromium (total)			X	
vinyl chloride			X		copper (total)			X	
aldrin			X		cyanide (total)			X	
dieldrin			X		lead (total)			X	
chlordane			X		mercury (total)			X	
4,4 DDT			X		nickel (total)			X	
4,4 DDE			X		selenium (total)			X	
4,4 DDD			X		silver (total)			X	
endosulfan 1			X		thallium (total)			X	
endosulfan 11			X		zinc (total)			X	
endosulfan sulfate			X		2,3,7,8, tetrachlorodibenzo			X	
					p-dioxin			X	

A. KNOWN TO BE PRESENT
B. SUSPECTED TO BE PRESENT
C. KNOWN TO BE ABSENT
D. SUSPECTED TO BE ABSENT

TABLE 2 NJDEP EXPANDED PRIORITY POLLUTANTS

CHECK APPROPRIATE BOX

NAME	A	B	C	D		A	B	C	D
acrylamide			X		n,n-dimethyl aniline			X	
amitrole			X		3,3-dimethyl benzidine			X	
amyl alcohols			X		1,1-dimethylhydrazine			X	
aniline hydorchloride			X		dioxane			X	
anisole			X		diphenylamine			X	
auramine			X		ethylenimine			X	
benzotrichloride			X		hydrazine			X	
benzylamine			X		4,4'-methylene bis			X	
					(2-chloroaniline)				
o-chloroaniline			X		4,4'-methylenedianiline			X	
m-chloroaniline			X		methyl isobutyl ketone			X	
p-chloraniline			X		alpha-naphthylamine			X	
1-chloro-2-nitrobenzene			X		beta-naphthylamine			X	
1-chloro-4-nitrobenzene			X		n-methylaniline			X	
chloroprene			X		1,2-phenylenediamine			X	
chrysoidine			X		1,3-phenylenediamine			X	
cumene			X		1,4-phenylenediamine			X	
2,3-dichloroaniline			X		sudan 1 (solvent yellow 14)			X	
2,4-dichloroaniline			X		thiourea			X	
2,5-dichloroaniline			X		toluene sulfonic acids			X	
3,4-dichloroaniline			X		toluidines			X	
3,5-dichloroaniline			X		xylidines			X	
1,3-dichloropropene			X						
1,3-dimethoxybenzidine			X						

A. KNOWN TO BE PRESENT
B. SUSPECTED TO BE PRESENT
C. KNOWN TO BE ABSENT
D. SUSPECTED TO BE ABSENT

TABLE 3 EPA HAZARDOUS SUBSTANCES

CHECK APPROPRIATE BOX

NAME	A	B	C	D		A	B	C	D
acetaldehyde			X		isopropanolamine			X	
allyl alcohol				X	kelthane			X	
allyl chloride					kepone			X	
amyl acetate			X		malathion			X	
aniline			X		mercaptodimethur			X	
benzonitrile			X		methoxychlor			X	
benzyl chloride			X		methyl mercaptan			X	
butyl acetate			X		methyl methacrylate			X	
butylamine			X		methyl parathion			X	
captan			X		mevinphos			X	
carbaryl			X		mexacarbate			X	
carbofuran			X		monoethyl amine			X	
carbon disulfide			X		monomethyl amine			X	
chlorpyrifos			X		naled			X	
coumaphos			X		napthenic acid			X	
cresol			X		nitrotoluene			X	
crotonaldehyde			X		parathion			X	
cyclohexane			X		phenolsulfanate			X	
2,4-D (2,4-dichlorophenoxy			X		phosgene			X	
acetic acid)					propargite			X	
diazinon			X		propylene oxide			X	
dicamba			X		pyrethrins			X	
dichlobenil			X		quinoline			X	
dichlone			X		resorcinol			X	
2,2-dichloropropionic acid			X		strontium			X	
dichlorvos			X		strychnine			X	
diethyl amine			X		styrene			X	
dimethyl amine			X		2,4,5-T (2,4,5-trichloro-			X	
					phenoxy acetic acid)				
dinitrobenzene			X		TDE (tetrachloro-			X	
					diphenylethane)				
diquat			X		2,4,5-TP 2-(2,4,5-			X	
					trichlorophenoxy)				
					propanoic acid				
disulfoton			X		trichlorofon			X	
diuron			X		triethylamine			X	
epichlorohydrin			X		trimethylamine				X

A. KNOWN TO BE PRESENT
B. SUSPECTED TO BE PRESENT
C. KNOWN TO BE ABSENT
D. SUSPECTED TO BE ABSENT

TABLE 3 EPA HAZARDOUS SUBSTANCES (CONTINUED)

CHECK APPROPRIATE BOX

NAME	A	B	C	D		A	B	C	
ethanolamine			X		uranium			X	
ethion			X		vanadium			X	
ethylene diamine			X		vinyl acetate			X	
ethylene dibromide			X		xylene				X
formaldehyde			X		xylenol			X	
furfural			X		zirconium			X	
guthion			X						
isoprene			X						

A. KNOWN TO BE PRESENT
B. SUSPECTED TO BE PRESENT
C. KNOWN TO BE ABSENT
D. SUSPECTED TO BE ABSENT

GARDEN STATE LABORATORIES, INC.

Bacteriological and Chemical Testing

399 Stuyvesant Avenue

Irvington, N.J. 07111

Telephone
201-373-8007

MATHEW KLEIN, M.S., Director
HARVEY KLEIN, M.S., Lab. Supervisor

REPORT OF VOLATILE ORGANIC ANALYSIS

REPORT # 71201169
CLIENT # WHI01
DATE SUBMITTED: 12/1/87

TO: WHITE CHEMICAL
660 FRELINGHUYSEN AVE.

NEWARK NJ 07114

ATT: MR STEVE SHOPSIS

SAMPLE TYPE: WATER
SAMPLE ID: COMPOSITE EFFLUENT, 120187
SAMPLE LOCATION:

DATE SAMPLED: 12/1/87 TIME SAMPLED: 13:00

COMPOUND	RESULT	COMPOUND	RESULT
Chloromethane	<50.0	1,1,2 Trichloroethane	<50.0
Bromomethane	<50.0	cis-1,3 Dichloropropylene	<50.0
Dichlorodifluoromethane	<50.0	Benzene	<50.0
Vinyl Chloride	<50.0	2-Chloroethylvinyl ether	<50.0
Chloroethane	<50.0	Bromoform	<50.0
Methylene Chloride	<50.0	1,1,2,2 Tetrachloroethane	<50.0
Trichlorofluoromethane	<50.0	Tetrachloroethylene	<50.0
1,1 Dichloroethylene	<50.0	Toluene	<50.0
1,1 Dichloroethane	<50.0	Chlorobenzene	<50.0
trans-1,2 Dichloroethlylene	<50.0	Ethylbenzene	<50.0
Chloroform	<50.0	p-Xylene	<50.0
1,2 Dichloroethane	885.9	m-Xylene	<50.0
1,1,1 Trichloroethane	<50.0	o-Xylene	<50.0
Carbon Tetrachloride	<50.0	1,2 Dichlorobenzene	<50.0
Bromodichloromethane	<50.0	1,3 Dichlorobenzene	<50.0
1,2 Dichloropropane	<50.0	1,4 Dichlorobenzene	<50.0
trans-1,3 Dichloropropene	<50.0	1,2,4 Trichlorobenzene	---
Trichloroethlyene	<50.0	DATE OF ANALYSIS	12/6/87
Dibromochloromethane	<50.0		
Methyl tert-Butyl Ether	<50.0		
Isopropyl Ether	<50.0		

RESULTS ARE IN PARTS PER BILLION.
<=LESS THAN, NONE DETECTED. ANALYSIS PERFORMED BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY USEPA METHOD 624.

THE LIABILITY OF GARDEN STATE LABORATORIES, INC. FOR SERVICES RENDERED SHALL IN NO EVENT EXCEED THE AMOUNT OF THE INVOICE.

Certified by U.S. Public Health Service, N.J. Dept. of Health and N.J.D.E.P. – Lab #07044

REPORT OF ANALYSIS

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

COMPOUND	RESULT	COMPOUND	RESULT
Chloromethane	<50.0	1,1,2 Trichloroethane	<50.0
Bromomethane	<50.0	cis-1,3 Dichloropropylene	<50.0
Dichlorodifluoromethane	<50.0	Benzene	<50.0
Vinyl Chloride	<50.0	2-Chloroethylvinyl ether	<50.0
Chloroethane	<50.0	Bromoform	<50.0
Methylene Chloride	<50.0	1,1,2,2 Tetrachloroethane	<50.0
Trichlorofluoromethane	<50.0	Tetrachloroethylene	<50.0
1,1 Dichloroethylene	<50.0	Toluene	<50.0
1,1 Dichloroethane	<50.0	Chlorobenzene	<50.0
trans-1,2 Dichloroethylene	<50.0	Ethylbenzene	<50.0
Chloroform	<50.0	o-Xylene	<50.0
1,2 Dichloroethane	885.9	m-Xylene	<50.0
1,1,1 Trichloroethane	<50.0	o-Xylene	<50.0
Carbon Tetrachloride	<50.0	1,2 Dichlorobenzene	<50.0
Bromodichloromethane	<50.0	1,3 Dichlorobenzene	<50.0
1,2 Dichloropropane	<50.0	1,4 Dichlorobenzene	<50.0
trans-1,3 Dichloropropene	<50.0	1,2,4 Trichlorobenzene	
Trichloroethylene	<50.0	DATE OF ANALYSIS	[illegible]
Dibromochloromethane	<50.0		
Methyl Tert-butyl Ether	<50.0		
Isopropyl Ether	<50.0		

RESULTS ARE IN PARTS PER BILLION.

[illegible]

55/JF

GARDEN STATE LABORATORIES, INC.

Bacteriological and Chemical Testing
399 Stuyvesant Avenue
Irvington, N.J. 07111

Telephone
201-373-8007

MATHEW KLEIN, M.S., Director
HARVEY KLEIN, M.S., Lab Supervisor

WHITE CHEMICAL
P. O. BOX 2500
NEWARK, NJ 07114

SAMPLE SUBMITTED: TUES. DECEMBER 1, 1987

COMPOSITE EFFLUENT WATER #120187

RESULTS ARE IN MG/L UNLESS NOTED.

TOTAL SOLIDS	154.	SULFIDE	<1.0
TOTAL MINERAL SOLIDS	102.	PH - STANDARD UNITS	7.72
TOTAL SUSPENDED SOLIDS	6.0	TOTAL KJELDAHL NITROGEN	<0.1
MINERAL SUSPENDED SOLIDS	3.0	AMMONIA-NITROGEN	<0.1
PETROLEUM HYDROCARBON	<1.0	ORTHO PHOSPHATE	0.20
BIOCHEMICAL OXYGEN DEMAND	3.0	ANTIMONY	0.10
CHEMICAL OXYGEN DEMAND	11.0	IRON	0.04
TOTAL ORGANIC CARBON	5.93	NICKEL	<0.03
SILVER	<0.03	PHENOLS	0.002

THE LIABILITY OF GARDEN STATE LABORATORIES, INC. FOR SERVICES RENDERED SHALL IN NO EVENT EXCEED THE AMOUNT OF THE INVOICE.

Certified by U.S. Public Health Service, N.J. Dept. of Health and N.J.D.E.P.—Lab #07044

CHARLES A. LAGOS
CHAIRMAN

VINCENT CORRADO, SR.
VICE CHAIRMAN

ROBERT M. BURKE, JR.
THOMAS J. CIFELLI
ROBERT J. DAVENPORT
KENNETH W. HAYDEN
DONALD TUCKER

COMMISSIONERS

Passaic Valley
Sewerage Commissioners

600 WILSON AVENUE
NEWARK, N. J. 07105
(201) 344-1800

CARMINE T. PERRAPATO
EXECUTIVE DIRECTOR

JAMES M. PIRO
CHIEF COUNSEL

NORMAN E. DARMSTATTER
CLERK

July 15, 1988

White Chemical Company
660 Frelinghuysen Avenue
Newark, New Jersey 07114

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Attn: Steven Shopsis

RE: NOTICE OF VIOLATION
PERMIT NO. 21404460
VIOLATION DATE: 07/05/88
SECTION VIOLATED:312.1 B & 315.2

Dear Mr. Shopsis:

On July 5, 1988 a routine inspection was made of your pH control system. The pH recorder charts were reviewed at outlet #1, where the tape was not dated, and at outlet #2 for the period 05/10/88 to 06/09/88. During these periods, the pH was out of compliance for a total 16.7% of the time at outlet #1 and 27.9% of the time at outlet #2. This is violation of section 312.1 B of the Passaic Valley Sewerage Commissioners Rules and Regulations. Federal Regulations do not permit excursions of more than 7 hours and 26 minutes in any calendar month or for more than 1 hour at any one time.

It appears that your pH control system is not functioning properly and that not enough attention is being given to pH monitoring and control by your personnel. You are reminded that it is important to date the pH tapes daily.

Please respond to this letter in writing within 10 days with an explantion for the violations and with a plan and timetable designed to eliminate them in the future. Failure to do so could result in fines and other penalties.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Carmine T. Perrapato,
Executive Director

CTP/mc

cc: Robert Davenport, Deputy Executive Director
Frank D'Ascensio
City of Newark

INDVIO 1

INDUSTRIAL VIOLATION INFORMATION

PERMIT_NO: 2140460

COMPANY_NAME: White Chemical Co.

LOCATION: 660 Franklinghuysen COMMUNITY: Newark.

VIOLATION_DATE: 07/05/88. SECTION_VIOLATED: 312.1 B.

X DESCRIPTION: Exceeded pH limit. FORMAL_NOTICE_SENT: Y. 7/16/88

SKED_ELIMINATION: _____. ACTUAL_ELIMINATION: 07/15/88

VISIT1: 07/05/88. COMMENT1: See file.

VISIT2: _____. COMMENT2: _____.

VISIT3: _____. COMMENT3: _____.

VISIT4: _____. COMMENT4: _____.

7/22/88

7/25/88.

Another Sheet

414.75
G

PASSAIC VALLEY SEWERAGE COMMISSIONERS

SEWER CONNECTION PERMIT

PERMIT # 21404463

(Please use the Permit Number on any correspondence with PVSC)

In compliance with the provisions of the Federal Water Pollution Control Act, its amendments, the Clean Water Act and the Rules and Regulations of the Passaic Valley Sewerage Commissioners

White Chemical Corporation

(herein after referred to as the Permittee)

is authorized to discharge from a facility located at

660 Frelinghuysen Avenue

Newark, New Jersey 07114

to the Passaic Valley Sewerage Commissioners Treatment Works in accordance with discharge limitations, monitoring requirements and other conditions set forth herein.

Effective Date 7/25/88

Expiration Date 7/25/93

PASSAIC VALLEY SEWERAGE COMMISSIONERS

by: _____
Executive Director

SUPERSEDED

BAE 000012

CONDITIONS

A. General Prohibitions

(1) No person shall discharge or deposit or cause or allow to be discharged or deposited into the treatment works or public sewer any waste which contains the following:

(A) Explosive Mixtures. Pollutants which create a fire or explosion hazard to the treatment works, collection system or to the operation of the system. Prohibited materials include, but are not limited to, gasoline, kerosene, naphta, benzene, toluene, xylene, ethers, etc.

(B) Corrosive Wastes. Any waste which will cause corrosion or deterioration of the treatment works. All wastes must have a pH not less than 5. Unless otherwise stated in the Sewer Connection Permit, all waste shall have a pH not more than 10.5. Prohibited materials include, but are not limited to, acids, sulfides, concentrated chloride or flouride compounds, etc.

(C) Solid or Viscous Wastes. Solid or viscous wastes which would cause obstruction to the flow in a sewer, or otherwise interfere with the proper operation of the treatment works. Prohibited materials include, but are not limited to, uncomminuted garbage, bones, hides or fleshings, cinders, sand, stove or marble dust, glass, etc.

(D) Oils and Grease. (a) any industrial wastes containing floatable fats, wax, grease or oils. (b) any industrial wastes containing more than 100 mg/l of emulsified mineral oil or grease.

(E) Noxious Material. Noxious or malodorous solids, liquids or gases, which, either singly or by interaction with other wastes, are capable of creating a public nuisance or hazard to life, or are or may be sufficient to prevent entry into a sewer for its maintenance and repair.

EXHIBIT

(F) Radioactive Wastes. Radioactive wastes or isotopes of such half life or concentration that they do not comply with regulations or odors issued by the appropriate authority having control over their use and which will, or may, cause damage or hazards to the treatment works or personnel operating the system.

(G) Excessive Discharge Rate. Industrial waste discharged in a slug of such volume or strength so as to cause a treatment process upset and subsequent loss of treatment efficiency.

(H) Heat (a) any discharge in excess of 150°F (65°C) (b) Heat in amounts which would inhibit biological activity in the PVSC treatment works resulting in a treatment process upset and subsequent loss of treatment efficiency, but in no case shall heat be introduced into the PVSC treatment works in such quantities that the temperature of the influent waters at the treatment plant exceed 40°C (104°F).

(I) Unpolluted Waters. Any unpolluted water including, but not limited to, cooling water or uncontaminated storm water, which will increase the hydraulic load on the treatment system, except as approved by PVSC.

(J) Water. Any water added for the purpose of diluting wastes which would otherwise exceed applicable maximum concentration limits.

(2) No person shall discharge or convey, or permit to be discharged or conveyed, to the treatment works any wastes containing pollutants of such character or quantity that will:

(A) Not be susceptible to treatment or interfere with the

SUPERSEDED

process or efficiency of the treatment system.

(B) Violate pretreatment standards. As pretreatment standards for toxic or other hazardous pollutants are promulgated by USEPA for a given industrial category, all industrial users within that category must immediately conform to the USEPA timetable as well as any numeric limitations imposed by USEPA. In addition, an industrial user shall comply with any more stringent standards as determined by PVSC or other agency.

(C) Cause the PVSC treatment plant to violate its NPDES permit, applicable receiving water standards, permit regulating sludge which is produced during treatment or any other permit issued to PVSC.

B. INSTALLATION OF SAMPLERS

The permittee shall install a 24 hour composite sampler on outlets 1 & 2 acceptable to PVSC with attachments for affixing seals,

which shall be maintained in proper working order at all times. The installed samplers shall draw a sample, which shall be representative of plant waste, in accordance with the monitoring schedule contained in Section C , Page (5 & 6 of 15 .

Permittee shall insure that the sample is maintained between 1^0C-4^0C during and after sample collection.

SPECIMEN

C. **EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS**

1. During the period beginning (07/25/88) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) number(ed) (21404461-43200-0201). Such discharge shall be monitored by the permittee as specified below. Volume to be determined from water consumption data less 5% credit for evaporation. Outlet to have a separate water consumption meter. Building 34

SUPERSEDED

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	DAY AVERAGE	DAILY MAX	MEASUREMENT FREQUENCY	SAMPLE TYPE	REPORTING PERIOD
BOD (0310)	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Quarterly	24 hr. comp.	Quarterly
TSS (0530)	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Quarterly	24 hr. comp.	Quarterly
pH (9000)	XXXXXXXXXXXXXX	5 to 10.5	Continuous	Recorder	*
LEL	XXXXXXXXXXXXXX	40%	Continuous	Recorder	*
Polybrominated biphenyls	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Deca Bromobiphenyl Oxide	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Chlorinated Organics	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Volume	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Quarterly

* Permittee to store pH and LEL Recorder Charts and have available for review by PVSC personnel on demand.

C. **EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS**

1. During the period beginning (07/25/88) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) number(ed) (21404462-43200-0201). Such discharge shall be monitored by the permittee as specified below. Volume to be determined from water consumption data less 5% credit for evaporation.

Building 33

SUPERSEDED

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	~~DAILY~~ ~~AVERAGE~~	DAILY MAX	MEASUREMENT FREQUENCY	SAMPLE TYPE	REPORTING PERIOD
BOD (0310)	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Quarterly	24 hr. comp.	Quarterly
TSS (0530)	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Quarterly	24 hr. comp.	Quarterly
pH (9000)	XXXXXXXXXXXXXXX	5 to 10	Continuous	Recorder	*
Polybrominated biphenyls	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Deca Bromobiphenyl Oxide	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Chlorinated Organics	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Volume	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Quarterly

* Permittee to store pH Recorder Charts and have available for review by PVSC personnel on demand.

C. **EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS**

1. During the period beginning (07/25/88) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) number(ed) (21404463-43200-0201). Such discharge shall be monitored by the permittee as specified below. Volume to be determined from water consumption data. Domestic waste only to be discharged from this outlet. Outlet to have separate water meters. Buildings 33 and 35

SUPERSEDED

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	DAY AVERAGE	DAILY MAX	MEASUREMENT FREQUENCY	SAMPLE TYPE	REPORTING PERIOD
BOD (0310)	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	N/A *	N/A *	XXXXXXXXXXXXXXX
TSS (0530)	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	N/A	N/A *	XXXXXXXXXXXXXXX
Volume	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	XXXXXXXXXXXXXXX	Quarterly

* Concentration for User Charge to be determined from Residential Strength Standards.

White Chemical
214044463

SUPERSEDED

2. In addition to the monitoring required in Section C.1. the Permittee is required to meet the following schedule of compliance:

   A. Analysis of wastewater parameters shall be performed by a laboratory that has been certified by the State of New Jersey.

   B. Installation of water meter:

      09/06/88 Water meter to be installed on domestic discharge in building 33.

   C. When final pretreatment standards are promulgated permittee shall submit baseline report to PVSC in accordance with 40 CFR 403.12 and any subsequent revisions. (copy attached).

D. Monitoring and Reporting

1. User Charge

Monitoring results obtained during the previous 3 months shall be reported on Discharge Monitoring Report Form MR-2. Reports are due January 21, April 21, July 21, October 21. The first report is due on (*). If an Industrial user fails to submit Form MR-2 on a timely basis, the Executive Director shall estimate the use for the period. The estimates may be made 30 days after the due date of the report, except for the fourth quarter where the estimates may be made after October 21.

2. Pretreatment

Monitoring results shall be reported on Discharge Monitoring Report Form, MR-1 and shall be submitted as specified in Section

3. Reports

Properly signed reports required herein shall be submitted to PVSC at the following address:

Passaic Valley Sewerage Commissioners
Industrial Waste Control Department
600 Wilson Avenue
Newark, NJ 07105

SUPERSEDED

4. Test Procedures

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. Test procedures for the analysis of pollutants shall conform to regulations contained in the PVSC Rules and Regulations, Federal, State and local laws or regulations.

5. Recording of Results

For each measurement of a sample taken pursuant to the requirements of this permit, the permittee shall maintain a record of the following information:

a) The date, exact place and time of sampling;
b) The dates the analyses were performed;
c) The person (s) who performed the analysis;
d) The analytical techniques or methods used;
e) The results of all required analyses.

* Permittee has been required to submit Monitoring Reports MR-2 to PVSC since 10/15/83.

6. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location (s) designated herein more frequently than required by this permit, using the approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Forms (PVSC Form MR-1 or MR-2). Such increased frequency shall also be indicated.

7. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed, calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of (5) years.

8. Definitions

a) The "30 day average" discharge means the average of daily values for 30 consecutive monitoring days. For the purpose of enforcement of Pretreatment Standards, consecutive samples taken and analyzed shall be considered as being taken on consecutive days even though one or more non-sampling days intervene. In applying the Pretreatment Standards where more than one but less than 30 samples have been taken and analyzed during any month, a formula, specified by USEPA, will be used to calculate the "30 day average".

b) The "daily maximum" discharge means the highest discharge by weight or other appropriate units as specified herein, during any calendar day.

c) "Daily" - each operating day.

d) "Weekly" - one day each week during a normal operating day.

e) "Monthly" - one day each month during a normal operating day.

f) "Composite" - a combination of individual samples obtained at regular intervals over the entire discharge day.

PRESS

The volume of each sample shall be proportional to the discharge flow rate unless specifically modified by PVSC. For a 24 hour continuous discharge, a mininum of 24 individual samples shall be collected at equal intervals and at least once per hour. For continuous discharges of less than 12 hours, individual samples shall be taken at least once every 30 minutes. For discharges which are not continuous, individual samples shall be taken such that they will be representative of plant waste.

g. "Grab" - an individual sample collected in less that 15 minutes.

h. "Quarterly" - every three (3) months.

i. "N/A" - not applicable.

E. MANAGEMENT REQUIREMENTS

1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or modification which will result in new, different, or increased discharges of pollutants must be reported by submission of a new PVSC Sewer Connection Application or, if such changes will not violate the effluent limitations specified in this permit, by notices to PVSC of such changes. Following such notices, the permit may be modified to specify and limit any pollutants not previously limited.

SUPERSEDED

2. Noncompliance Notification

If, for any reason, the permittee does not comply with, or will be unable to comply with any effluent limitation specified in this permit, the permittee shall notify PVSC within 24 hours of the occurrence. If this

report is made orally, a written report containing the following information, shall be submitted within five (5) working days:

a) a description of the discharge and the cause of the period of noncompliance;

b) the period of noncompliance, including exact dates and times, or, if not corrected, the anticipated time the noncompliance is expected to continue, and

c) the steps being taken to reduce, eliminate and prevent a recurrence of the noncomplying discharge.

3. Facilities Operation

The permittee shall at all times maintain in good working order and operate as efficiently as possible all pretreatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to the PVSC Treatment Works resulting from noncompliance with any pretreatment limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge. This condition in no way affects PVSC's right to suspend a permit in order to stop a discharge which presents an imminent or substantial hazard to the public health, safety or welfare to the local environment or which interferes with the operation of the PVSC Treatment Works.

5. Removed Substances

Solids, sludges, filter backwash or other pollutants or hazardous waste removed in the course of pretreatment or control of wastewaters and/or the treatment of intake waters shall be disposed of in accordance with applicable

SUPERSEDED

Federal, State and local laws and regulations. Records documenting such disposal shall be made available to PVSC for review upon request.

F. MANAGEMENT RESPONSIBILITIES

1. Right of Entry

The permittee shall allow the authorized representatives of PVSC, upon the presentation of credentials:

a) To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b) At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring methods required in this permit; and to sample any discharge of pollutants.

2. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall, in writing, notify the succeeding owner or controller of the existence of this permit, and the need to apply for a new permit, a copy of which shall be forwarded to PVSC.

SUPERSEDED

3. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, or revoked in whole or in part during its terms for cause including, but not limited to, the following:

a) Violation of any terms or conditions of this permit;

b) Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c) A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

4. Toxic Pollutants

Notwithstanding (Section C), above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition), is established under Section 307 (b) of the Federal Water Pollution Control Act (the Act), its amendments, or any other subsequent law or regulation, for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

5. Civil and Criminal Liability

Nothing in this permit shall be construed to relieve the permittee from Civil or criminal penalties for noncompliance.

6. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State Law or regulation under authority preserved by Section 510, of the Federal Water Pollution Control Act. (the Act)

7. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

SUPERSEDED

8. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

SUPERSEDED

PASSAIC VALLEY SEWERAGE COMMISSIONERS

SEWER CONNECTION PERMIT

PERMIT # 21404463

VOID

(Please use the Permit Number on any correspondence with PVSC)
In compliance with the provisions of the Federal Water Pollution Control Act, its amendments, the Clean Water Act and the Rules and Regulations of the Passaic Valley Sewerage Commissioners:

White Chemical Corporation

(herein, after referred to as the Permittee)

is authorized to discharge from a facility located at

660 Frelinghuysen Avenue

Newark, New Jersey 07114

to the Passaic Valley Sewerage Commissioners Treatment Works in accordance with discharge limitations, monitoring requirements and other conditions set forth herein.

EFFECTIVE DATE 07/25/88

EXPIRATION DATE 07/25/93

PASSAIC VALLEY SEWERAGE COMMISSIONERS

BY: _____
EXECUTIVE DIRECTOR

CONDITIONS

A. GENERAL PROHIBITIONS

1. No person shall discharge or deposit or cause or allow to be discharged or deposited into the treatment works or public sewer any waste which contains the following:

   a. **EXPLOSIVE MIXTURES**

   Pollutants which create a fire or explosion hazard to the treatment works, collection system or to the operation of the system. Prohibited materials include, but are not limited to, gasoline, kerosene, naphta, benzene, toluene, xylene, ethers, etc.

   b. **CORROSIVE WASTES**

   Any waste which will cause corrosion or deterioration of the treatment works. All wastes must have a pH not less than 5. Unless otherwise stated in the Sewer Connection Permit, all waste shall have a pH not more than 10.5 . Prohibited materials include, but are not limited to, acids, sulfides, concentrated chloride or flouride compounds, etc.

   c. **SOLID OR VISCOUS WASTES**

   Solid or viscous wastes which would cause obstruction to the flow in a sewer, or otherwise interfere with the proper operation of the treatment works. Prohibited materials include, but are not limited to, uncomminuted garbage, bones, hides or fleshings, cinders, sand, stove or marble dust, glass, etc.

   d. **OILS AND GREASE**

   (1) any industrial wastes containing floatable fats, wax, grease or oils.

   (2) any industrial wastes containing more than 100 mg/l of petroleum hydrocarbons.

   e. **NOXIOUS MATERIAL**

   Noxious or malodorous solids, liquids or gases, which, either singly or by interaction with other wastes, are capable of creating a public nuisance or hazard to life, or are or may be sufficient to prevent entry into a sewer for its maintenance and repair.

   f. **RADIOACTIVE WASTES**

   Radioactive wastes or isotopes of such half life or concentration that they do not comply with regulations or orders issued by the appropriate authority having control over their use and which will, or may cause damage or hazards to the treatment works or personnel operating the system.

g. **EXCESSIVE DISCHARGE RATE**

Industrial wastes discharged in a slug of such volume or strength so as to cause a treatment process upset and subsequent loss of treatment efficiency.

h. **HEAT**

(1) any discharge in excess of 150^0 F (65^0C)

(2) Heat in amounts which would inhibit biological activity in the PVSC treatment works resulting in a treatment process upset and subsequent loss of treatment efficiency, but in no case shall heat be introduced into the PVSC treatment works in such quantities that the temperature of the influent waters at the treatment plant exceed 40^0C (104^0F).

i. **UNPOLLUTED WATERS**

Any unpolluted water including, but not limited to, cooling water or uncontaminated storm water, which will increase the hydraulic load on the treatment system, except as approved by PVSC.

j. **WATER**

Any water added for the purpose of diluting wastes which would otherwise exceed applicable maximum concentration limits.

2. No person shall discharge or convey, or permit to be discharged or conveyed, to the treatment works any wastes containing pollutants of such character or quantity that will:

a. Not be susceptible to treatment or interfere with the process or efficiency of the treatment system.

b. Violate pretreatment standards. As pretreatment standards for toxic or other hazardous pollutants are promulgated by USEPA for a given industrial category, all industrial users within that category must immediately conform to the USEPA timetable as well as any numeric limitations imposed by USEPA. In addition, an industrial user shall comply with any more stringent standards as determined by PVSC or other agency.

c. Cause the PVSC treatment plant to violate its NJPDES permit, applicable receiving water standards, permit regulating sludge which is produced during treatment or any other permit issued to PVSC.

B. **INSTALLATION OF SAMPLERS**

The permittee shall install a 24 hour composite sampler on Outlets #1 & #2 acceptable to PVSC with attachments for affixing seals,

which shall be maintained in proper working order at all times. The installed samplers shall draw a sample, which shall be representative of plant waste, in accordance with the monitoring schedule contained in Section C **,**
Page(s) 5 & 6 **of** 17 **.**

Permittee shall insure that the sample is maintained between 1^0C-4^0C during and after sample collection.

C. EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS

1. During the period beginning (07/25/88) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) number(ed) (21404461-43200-0201). Such discharge shall be monitored by the permittee as specified below. Volume to be determined from water consumption data less 5% credit for evaporation. Outlet to have a separate water consumption meter. Building 34.

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	XXDAYXX AVERAGEXX	DAILY MAX	MEASUREMENT FREQUENCY	SAMPLE TYPE	REPORTING PERIOD
BOD (0310)	XXXXXXX	XXXXXX	Quarterly	24 hr. comp.	Quarterly
TSS (0530)	XXXXXXX	XXXXXX	Quarterly	24 hr. comp.	Quarterly
pH (9000)	XXXXXXX	5 to 10.5	Continuous	Recorder	*
LEL	XXXXXXX	40%	Continuous	Recorder	*
Polybrominated biphenyls	XXXXXXX	XXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Deca Bromobiphenyl Oxide	XXXXXXX	XXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Chlorinated Organics	XXXXXXX	XXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Volume	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	Quarterly

* Permittee to store pH and LEL Recorder Charts and have available for review by PVSC personnel on demand.

Rev: 6/90

C. EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS

1. During the period beginning (07/25/88) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) number(ed) (21404462-43200-0201). Such discharge shall be monitored by the permittee as specified below. Volume to be determined from water consumption data less 5 % credit for evaporation. Building 33.

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	XXDAYXX AVERAGEXX	DAILY MAX	MEASUREMENT FREQUENCY	SAMPLE TYPE	REPORTING PERIOD
BOD (0310)	XXXXXXX	XXXXXXX	Quarterly	24 hr. comp.	Quarterly
TSS (0530)	XXXXXXX	XXXXXXX	Quarterly	24 hr. comp.	Quarterly
pH (9000)	XXXXXXX	5 to 10.5	Continuous	Recorder	*
Polybrominated biphenyls	XXXXXXX	XXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Deca Bromobiphenyl Oxide	XXXXXXX	XXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Chlorinated Organics	XXXXXXX	XXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Volume	XXXXXXX	XXXXXXX	XXXXXX	XXXXXX	Quarterly

* Permittee to store pH Recorder Charts and have available for review by PVSC personnel on demand.

Rev: 6/90

C. EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS

1. During the period beginning (07/25/88) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) number(ed) (21404463-43200-0201). Such discharge shall be monitored by the permittee as specified below. Volume to be determined from water consumption data. Domestic waste only to be discharged from this outlet. Outlet to have separate water meters. Buildings 33 and 35.

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	DAY AVERAGE	DAILY MAX	MEASUREMENT FREQUENCY	SAMPLE TYPE	REPORTING PERIOD
BOD (0310)	XXXXXX	XXXXXX	N/A *	N/A *	XXXXX
TSS (0530)	XXXXXX	XXXXXX	N/A *	N/A *	XXXXX
Volume	XXXXXX	XXXXXX	XXXXXX	XXXXXX	Quarterly

* Concentration for User Charge to be determined from Residential Strength Standards.

Rev: 6/90

C. EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS

1. During the period beginning (11/05/90) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) numbered (21404461-43200-0201). Such discharge shall be monitored by the permittee as specified below. Building 34. Volume to be determined from water consumption data less 5% credit for evaporation. Outlet to have a separate water consumption meter. Permittee to submit volume in accordance with PVSC Pretreatment Monitoring Report Form MR-1.

40 CFR 414.75, Subpart G

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	All units are in Micrograms per liter		Measurement Frequency	Sample Type	Reporting Period
	DAILY MAX.	MONTHLY AVG.			
VOLUME	XXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXXXXX	XXXXXXXXXXXXX	Semi-Annually
(a)	(a)	(a)	Twice/Year	(a)	Semi-Annually

(a) See Page 11 of 17, Section 2D of this Permit for Effluent Characteristics, Daily and Monthly Discharge Limitations, and Sample Type.

C. EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS

1. During the period beginning (11/05/90) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) numbered (21404462-43200-0201). Such discharge shall be monitored by the permittee as specified below. Building 33. Volume to be determined from water consumption data less 5% credit for evaporation. Permittee to submit volume in accordance with PVSC Pretreatment Monitoring Report Form MR-1.

40 CFR 414.75, Subpart G

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	All units are in Micrograms per liter		Measurement Frequency	Sample Type	Reporting Period
	DAILY MAX.	MONTHLY AVG.			
VOLUME	XXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXXXXX	XXXXXXXXXXXX	Semi-Annually
(a)	(a)	(a)	Twice/Year	(a)	Semi-Annually

(a) See Page 11 of 17, Section 2D of this Permit for Effluent Characteristics, Daily and Monthly Discharge Limitations, and Sample Type.

2. In addition to the monitoring required in Section C.1. the Permittee is required to meet the following schedule of compliance:

   A. Analysis of wastewater parameters shall be performed by a laboratory that has been certified by the State of New Jersey.

   B. Installation of water meter:

      09/06/88 Water meter to be installed on domestic discharge in building 33.

   C. Pretreatment Compliance Requirements - Organic Chemicals Categorical Pretreatment Standards 40 CFR 414.

      11/05/90 Permittee to be in compliance with Organic Chemicals Categorical Pretreatment Standards 40 CFR 414.75 Subpart G.

      02/05/91 Permittee to submit a Compliance Report to PVSC demonstrating compliance with Organic Chemicals Pretreatment Standards. The report shall be in accordance with General Pretreatment Regulations 40 CFR 403.12 section (d).

      7/21/91 First Periodic Compliance Monitoring Report due. Permittee to submit Periodic Compliance Monitoring Report Semi-Annually January 21 and July 21 in accordance with General Pretreatment Regulations 40 CFR 403.12 section (e).

ADDITIONAL REQUIREMENTS SECTION C2 CONTINUED:

D.

Effluent Characteristics	Maximum for any one day	Maximum for monthly average	Sample Type
Benzene	134	57	Grab
Carbon Tetrachloride	380	142	Grab
Chlorobenzene	380	142	Grab
1,2,4-Trichlorobenzene	794	196	Composite
Hexachlorobenzene	794	196	Composite
1,2-Dichloroethane	574	180	Grab
1,1,1-Trichloroethane	59	22	Grab
Hexachloroethane	794	196	Composite
1,1-Dichloroethane	59	22	Grab
1,1,2-Trichloroethane	127	32	Grab
Chloroethane	295	110	Grab
Chloroform	325	111	Grab
1,2-Dichlorobenzene	794	196	Composite
1,3-Dichlorobenzene	380	142	Composite
1,4-Dichlorobenzene	380	142	Composite
1,1-Dichloroethylene	60	22	Grab
1,2-Trans-Dichloroethylene	66	25	Grab
1,2-Dichloropropane	794	196	Grab
1,3-Dichloropropylene	794	196	Grab
Ethylbenzene	380	142	Grab
Methylene Chloride	170	36	Grab
Methyl Chloride	295	110	Grab
Hexachlorobutadiene	380	142	Composite
Nitrobenzene	6402	2237	Composite
2-Nitrophenol	231	65	Composite
4-Nitrophenol	576	162	Composite
4,6-Dinitro-O-Cresol	277	78	Composite
Tetrachloroethylene	164	52	Grab
Toluene	74	28	Grab
Trichloroethylene	69	26	Grab
Vinyl Chloride	172	97	Grab
Total Cyanide	1200	420	Grab
Total Lead	690	320	Composite
Total Zinc	2610	1050	Composite

D. MONITORING AND REPORTING

1. USER CHARGE

Monitoring results obtained during the previous 3 months shall be reported on Discharge Monitoring Report Form MR-2. Reports are due January 21, April 21, July 21, October 21. The first report is due on (*). If an Industrial user fails to submit Form MR-2 on a timely basis, the Executive Director shall estimate the use for the period. The estimates may be made 30 days after the due date of the report, except for the fourth quarter where the estimates may be made after October 21.

2. PRETREATMENT

Monitoring results shall be reported on Discharge Monitoring Report Form, MR-1 Semi-Annually. Reports are due January 21 and July 21.

3. REPORTS

Properly signed reports required herein shall be submitted to PVSC at the following address:

PASSAIC VALLEY SEWERAGE COMMISSIONERS
INDUSTRIAL WASTE CONTROL DEPARTMENT
600 Wilson Avenue
Newark, NJ 07105

4. TEST PROCEDURES

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. Test procedures for the analysis of pollutants shall conform to regulations contained in the PVSC Rules and Regulations, Federal, State and local laws or regulations.

5. RECORDING OF RESULTS

For each measurement of a sample taken pursuant to the requirements of this permit, the permittee shall maintain a record of the following information:

a. The date, exact place and time of sampling;
b. The dates the analyses were performed;
c. The person (s) who performed the analysis;
d. The analytical techniques or methods used;
e. The results of all required analyses.

* Permittee has been required to submit Monitoring Reports MR-2 to PVSC since 10/15/83.

6. **ADDITIONAL MONITORING BY PERMITTEE**

If the permittee monitors any pollutant at the location (s) designated herein more frequently than required by this permit, using the approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Forms (PVSC Form MR-1 or MR-2). Such increased frequency shall also be indicated.

7. **RECORDS RETENTION**

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed, calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of (5) years.

8. **DEFINITIONS**

a. The "30 day average" discharge means the average of daily values for 30 consecutive monitoring days. For the purpose of enforcement of Pretreatment Standards, consecutive samples taken and analyzed shall be considered as being taken on consecutive days even though one or more non-sampling days intervene. In applying the Pretreatment Standards where more than one but less than 30 samples have been taken and analyzed during any month, a formula, specified by USEPA, will be used to calculate the "30 day average".

b. The "daily maximum" discharge means the highest discharge by weight or other appropriate units, as specified herein, during any calendar day.

c. "Daily" - each operating day.

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f. "Composite" - a combination of individual samples obtained at regular intervals over the entire discharge day.

The volume of each sample shall be proportional to the discharge flow rate unless specifically modified by PVSC. For a 24 hour continuous discharge, a minimum of 24 individual samples shall be collected at equal intervals and at least once per hour. For continuous discharges of less than 12 hours, individual samples shall be taken at least once every 30 minutes. For discharges which are not continuous, individual samples shall be taken such that they will be representative of plant waste.

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E. MANAGEMENT REQUIREMENTS

1. CHANGE IN DISCHARGES

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or modification which will result in new, different, or increased discharges of pollutants must be reported by submission of a new PVSC Sewer Connection Application or, if such changes will not violate the effluent limitations specified in this permit, by notices to PVSC of such changes. Following such notices, the permit may be modified to specify and limit any pollutants not previously limited.

2. NONCONPLIANCE NOTIFICATION

If, for any reason, the permittee does not comply with, or will be unable to comply with any effluent limitation specified in this permit, the permittee shall notify PVSC within 24 hours of the occurrence.

If this report is made orally, a written report containing the following information, shall be submitted within five (5) working days:

a. A description of the discharge and the cause of the period of noncompliance;

b. The period of noncompliance, including exact dates and times, or, if not corrected, the anticipated time the noncompliance is expected to continue, and

c. The steps being taken to reduce, eliminate and prevent a recurrence of the noncomplying discharge.

3. **FACILITIES OPERATION**

The permittee shall at all times maintain in good working order and operate as efficiently as possible all pretreatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. **ADVERSE IMPACT**

The permittee shall take all reasonable steps to minimize any adverse impact to the PVSC Treatment Works resulting from noncompliance with any pretreatment limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge. This condition in no way affects PVSC's right to suspend a permit in order to stop a discharge which presents an imminent or substantial hazard to the public health, safety or welfare to the local environment or which interferes with the operation of the PVSC Treatment Works.

5. **REMOVED SUBSTANCES**

Solids, sludges, filter backwash or other pollutants or hazardous waste removed in the course of pretreatment or control of wastewaters and/or the treatment of intake waters shall be disposed of in accordance with applicable Federal, State and local laws and regulations. Records documenting such disposal shall be made available to PVSC for review upon request.

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1. RIGHT OF ENTRY

The permittee shall allow the authorized representatives of PVSC, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring methods required in this permit; and to sample any discharge of pollutants.

2. TRANSFER OF OWNERSHIP OR CONTROL

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall, in writing, notify the succeeding owner or controller of the existence of this permit, and the need to apply for a new permit, a copy of which shall be forwarded to PVSC.

3. PERMIT MODIFICATION

After notice and opportunity for a hearing, this permit may be modified, or revoked in whole or in part during its terms for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

4. **TOXIC POLLUTANTS**

Notwithstanding (Section C), above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition), is established under Section 307 (b) of the Federal Water Pollution Control Act (the Act), its amendments, or any other subsequent law or regulation, for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

5. **CIVIL AND CRIMINAL LIABILITY**

Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

6. **STATE LAWS**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State Law or regulation under authority preserved by Section 510, of the Federal Water Pollution Control Act. (The Act)

7. **PROPERTY RIGHTS**

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

8. **SEVERABILITY**

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances , is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

CHARLES A. LAGO
CHAIRMAN

VINCENT CORRADO, SR.
VICE CHAIRMAN

ROBERT M. BURKE, JR.
THOMAS J. CIFELLI
KENNETH W. HAYDEN
RAYMOND LUCHKO
DONALD TUCKER

COMMISSIONERS

Passaic Valley
Sewerage Commissioners

600 WILSON AVENUE
NEWARK, N.J. 07105
(201) 344-1800
Fax: (201) 344-2951

CARMINE T. PERRAPATO
EXECUTIVE DIRECTOR

ROBERT J. DAVENPORT
DEPUTY EXECUTIVE DIRECTOR

JAMES M. PIRO
CHIEF COUNSEL

NORMAN E. DARMSTATTER
CLERK

April 25, 1989

White Chemical Company
660 Frelinghuysen Avenue
Newark, New Jersey 07114

CERTIFIED MAIL

Attn: Steven Shopsis

RE: NOTICE OF VIOLATION
PERMIT # 21404463
VIOLATION DATE: 03/28/89
SECTION VIOLATED: 315.2

Dear Mr. Shopsis:

You are put on notice that your company is in violation of Section 315.2 of the Passaic Valley Sewerage Commissioners Rules and Regulation. During an inspection visit on 03/28/89 your LEL monitoring equipment was not operating in conformance with its intended use. Your LEL chart was unable to provide a continuous record on 03/01/89 because you "ran out" of propane gas during the night. As a result White Chemical did not comply with Sewer Connection Permit which requires continuous monitoring of the facilities outfall.

You are hereby directed to respond to this letter within 10 days stating how you plan to elminate this type of violation in the future.

If you have any questions concerning this matter please call Mario Graglia at (201) 344-1800 ext. 238.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Carmine T. Perrapato,
Executive Director

CTP/mc

cc: Robert Davenport, Deputy Executive Director
Frank D'Ascensio
City of Newark

INDUSTRIAL VIOLATION INFORMATION

PERMIT_NO: 2140463

COMPANY_NAME: White Chemical Company

LOCATION: 660 Frelinghuysen Ave. COMMUNITY: Newark.

VIOLATION_DATE: 03/28/89. SECTION_VIOLATED: 315.2.

DESCRIPTION: LEL mon. equip not op. correct FORMAL_NOTICE_SENT: Y.

SKED_ELIMIN: __/__/__. ACTUAL_ELIMIN: 05/07/89

VISIT1: 05/07/89. COMMENT1: Propane Cylinder in Place

VISIT2: __/__/__. COMMENT2: _____.

VISIT3: __/__/__. COMMENT3: _____.

VISIT4: __/__/__. COMMENT4: _____.

Close
10/26/89

LD
5/2

111-8/93

WHITE CHEMICAL CORPORATION

660 FRELINGHUYSEN AVENUE, NEWARK, N.J. 07114
P.O. BOX 2500

TELEPHONE 201-621-4100
TELEFAX 201-621-7096
TELEX 84 41 31

May 3, 1989

Mr. Mario Graglia
Passaic Valley Sewerage Commissioners
600 Wilson Avenue
Newark, NJ 07105

Re: Notice of Violation
Permit #21404463
Violation Date: 3/28/89
Section Violated: 315.2

Dear Mr. Graglia:

In response to the above noted violation, White Chemical did notify PVSC by telephone on 3/2/89 that the LEL meter had run out of propane gas during the previous night and that on the morning of 3/2/89 a spare cylinder which we keep for this purpose was put into service. On 3/6/89, a letter was sent to your attention; confirming the "down time". The cylinders being used are 100 lb. cylinders and the backup spare is a 20 lb. bottle.

A 100 lb. cylinder usually is good for a few months of operation and hence, I do not anticipate this problem reoccurring again for some time to come. (Should the cylinder run out on days (8:00 am to 5:00 pm), they are changed immediately, however, on nights, I prefer not having the supervisor doing the change over, reignition and recalibration owing to the delicacy of the machine.)

White Chemical will make every attempt to minimize the reoccurrence of this problem.

Sincerely yours,

WHITE CHEMICAL CORPORATION

Steven L. Shopsis
Plant Manager

MAY 1989
RECEIVED

SLS/nr

CHARLES A. LAGOS
CHAIRMAN

VINCENT CORRADO, SR.
VICE CHAIRMAN

ROBERT M. BURKE, JR.
THOMAS J. CIFELLI
KENNETH W. HAYDEN
DONALD TUCKER

COMMISSIONERS

Passaic Valley
Sewerage Commissioners

600 WILSON AVENUE
NEWARK, N. J. 07105
(201) 344-1800

CARMINE T. PERRAPATO
EXECUTIVE DIRECTOR

JAMES M. PIRO
CHIEF COUNSEL

NORMAN E. DARMSTATTER
CLERK

September 21, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

White Chemical Company
660 Frelinghuysen Avenue
Newark, New Jersey 07114

Attn: Steve Shopsis

RE: NOTICE OF VIOLATION
PERMIT NO. 21404460
VIOLATION DATE: 08/29/88
SECTION VIOLATED: 312.1 (B)

Dear Mr. Shopsis:

On 08/29/88 a routine inspection was made of your pH control systems. The pH recorder charts (Outlet #1) were reviewed for the period 07/12/88 to 08/12/88. During that period the pH was out of compliance for a total of 3 continuous hours and at the time of the inspection, the pH of the grab was less than three while the recorder was indicating a pH of four. Federal Regulations do not permit excursions of more than 1% over a calender month or more than 1 hour at any particular time. As a result White Chemical has violated the PVSC Rules and Regulations as outlined below:

1. 312.1 (B) - refers to the discharge of corrosive waste which caused damage to the sewer system.
2. 314.1 - refers to the notification procedure to be used in the event and individual user is unable to comply with the limitations contained in the PVSC Rules and Regulations or in the Sewer Connection Permit.
3. 315.2 - refers to proper maintenance of pretreatment equipment.

It appears that your pH control system is still not functioning properly and that not enough attention is being given to pH monitoring and control by your personnel.

Please respond to this letter in writing within 10 days with an explanation for these violations and with a plan to eliminate them in the future. Failure to do so could result in fines and other penalties.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Carmine T. Perrapato,
Executive Director

CTP/mc

cc: Robert Davenport, Deputy Executive Director
Frank D'Ascensio
City of Newark

CHARLES A. LAGOS
CHAIRMAN

VINCENT CORRADO, SR.
VICE CHAIRMAN

ROBERT M. BURKE, JR.
THOMAS J. CIFELLI
KENNETH W. HAYDEN
DONALD TUCKER

COMMISSIONERS

Passaic Valley
Sewerage Commissioners

600 WILSON AVENUE
NEWARK, N. J. 07105
(201) 344-1800

CARMINE T. PERRAPATO
EXECUTIVE DIRECTOR

JAMES M. PIRO
CHIEF COUNSEL

NORMAN E. DARMSTATTER
CLERK

September 20, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

White Chemical Company
660 Frelinghuysen Avenue
Newark, New Jersey 07114

Attn: Steve Shopsis

RE: NOTICE OF VIOLATION
PERMIT NO. 21404460
VIOLATION DATE: 08/29/88
SECTION VIOLATED: 312.1 (B)

Dear Mr. Shopsis:

On 08/29/88 a routine inspection was made of your pH control systems. The pH recorder charts (Outlet #2) were reviewed for the period 07/12/88 to 08/12/88. During that period the pH was out of compliance for a total of 291.75 hours or 33.8% of the time. Federal Regulations do not permit excursions of more than 1% over a calender month or more than 1 hour at any particular time. As a result White Chemical has violated the PVSC Rules and Regulations as outlined below:

1. 312.1 (B) - refers to the discharge of corrosive waste which caused damage to the sewer system.
2. 314.1 - refers to the notification procedure to be used in the event and individual user is unable to comply with the limitations contained in the PVSC Rules and Regulations or in the Sewer Connection Permit.

It appears that your pH control system is still not functioning properly and that not enough attention is being given to pH monitoring and control by your personnel.

Please respond to this letter in writing within 10 days with an explanation for these violations and with a plan to eliminate them in the future. Failure to do so could result in fines and other penalties.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Carmine T. Perrapato,
Executive Director

CTP/mc

cc: Robert Davenport, Deputy Executive Director
Frank D'Ascensio
City of Newark

INDVIO 1

INDUSTRIAL VIOLATION INFORMATION

PERMIT_NO: 2140446

COMPANY_NAME: White Chemical Co.

LOCATION: 660 Frelinghuysen COMMUNITY: Newark.

VIOLATION_DATE: 08/29/88. SECTION_VIOLATED: 312.1(B).

DESCRIPTION: Exceeded Pt Limits out.#1 FORMAL_NOTICE_SENT: Y.

SKED_ELIMINATION: _____. ACTUAL_ELIMINATION: 9/23/88

VISIT1: 9/23/88. COMMENT1: In Compliance see workorder WO# 40265

VISIT2: _____. COMMENT2: _____.

VISIT3: _____. COMMENT3: _____.

VISIT4: _____. COMMENT4: _____.

Closed

LD 9/23/88

D.E. 1/5/90

INDVIO 1

INDUSTRIAL VIOLATION INFORMATION

PERMIT_NO: 2140463.

COMPANY_NAME: White Chemical Co.

LOCATION: 660 Frelinghuysen COMMUNITY: Newark.

VIOLATION_DATE: 08/29/88. SECTION_VIOLATED: 312.1(B).

DESCRIPTION: Exceeded PH limit out #2 FORMAL_NOTICE_SENT: Y.

SKED_ELIMINATION: _____. ACTUAL_ELIMINATION: _____.

VISIT1: _____. COMMENT1: _____.

VISIT2: _____. COMMENT2: _____.

VISIT3: _____. COMMENT3: _____.

VISIT4: _____. COMMENT4: _____.

LD 9/23/88

CHARLES A. LAGOS
CHAIRMAN

VINCENT CORRADO, SR.
VICE CHAIRMAN

ROBERT M. BURKE, JR.
THOMAS J. CIFELLI
KENNETH W. HAYDEN
RAYMOND LUCHKO
DONALD TUCKER

COMMISSIONERS

Passaic Valley
Sewerage Commissioners

600 WILSON AVENUE
NEWARK, N.J. 07105
(201) 344-1800
Fax: (201) 344-2951

CARMINE T. PERRAPATO
EXECUTIVE DIRECTOR

ROBERT J. DAVENPORT
DEPUTY EXECUTIVE DIRECTOR

JAMES M. PIRO
CHIEF COUNSEL

NORMAN E. DARMSTATTER
CLERK

April 25, 1989

White Chemical Company
660 Frelinghuysen Avenue
Newark, New Jersey 07114

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Attn: Steven Shopsis

RE: NOTICE OF VIOLATION
PERMIT NO. 21404463
VIOLATION DATE: 02/01/89
SECTION VIOLATED: 312.1 (B)

Dear Mr. Shopsis:

On 02/01/89 a routine inspection was made of your pH control system. The pH recorder charts were reviewed for the period from 10/24/88 to 02/01/88 at outlet #2. During that period the pH was out of compliance for exceeding 11 continuous hours between 11/20/89 and 11/21/89 and 36 continuous hours between 12/13/88 and 12/16/88. Both occurrences were during weekends when the company was not in operation. Outlet #1 was in compliance for the period reviewed. On 03/23/89 another inspection of your pH control system was made. Outlet #2 was found to be in compliance. However Outlet #1 was found to be out of compliance for 104 hours or 14% of the period between 02/16/89 and 03/17/89 with four excursions of over one continuous hour. Federal Regulations do not permit excursions of more than 1% in any calendar month or more than 1 hour at any particular time. As a result White Chemical has violated the PVSC Rules and Regulations as outlined below:

1. 312.1 (B) - refers to the discharge of corrosive waste which could cause damage to the sewer system.
2. 314.1 - refers to the notification procedure to be used in the event an individual user is unable to comply with the limitations contained in the PVSC Rules and Regulations or in the Sewer Connection Permit.

It appears that your pH control system is still not functioning properly and that not enough attention is being given to pH monitoring and control by your personnel.

Please respond to this letter in writing within 10 days with a plan to eliminate your pH violations in the future. Failure to do could result in fines and other penalties. A copy of this letter is being forwarded to the PVSC attorneys for further action.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Carmine T. Perrapato,
Executive Director

CTP/mc

cc: Robert Davenport, Deputy Executive Director
Frank D'Ascensio
City of Newark
Gabriel M. Ambrosio, Esq.

INDUSTRIAL VIOLATION INFORMATION

PERMIT_NO: 21404463

COMPANY_NAME: White Chemical Co.

LOCATION: 660 Frelinghuysen Ave. COMMUNITY: Newark.

VIOLATION_DATE: 02/01/89. SECTION_VIOLATED: 312.1 (B).

DESCRIPTION: Plt out of compliance. FORMAL_NOTICE_SENT: Y.

SKED_ELIMIN: __/__/__. ACTUAL_ELIMIN: 5/5/89.

VISIT1: 5/5/89. COMMENT1: Reconock Replaced.

VISIT2: __/__/__. COMMENT2: _____.

VISIT3: __/__/__. COMMENT3: _____.

VISIT4: __/__/__. COMMENT4: _____.

5/12

CHARLES A. LAGOS
CHAIRMAN

VINCENT CORRADO, SR.
VICE CHAIRMAN

ROBERT M. BURKE, JR.
THOMAS J. CIFELLI
KENNETH W. HAYDEN
RAYMOND LUCHKO
DONALD TUCKER

COMMISSIONERS

Passaic Valley
Sewerage Commissioners

600 WILSON AVENUE
NEWARK, N.J. 07105
(201) 344-1800
Fax: (201) 344-2951

CARMINE T. PERRAPATO
EXECUTIVE DIRECTOR

ROBERT J. DAVENPORT
DEPUTY EXECUTIVE DIRECTOR

JAMES M. PIRO
CHIEF COUNSEL

NORMAN E. DARMSTATTER
CLERK

May 31, 1989

White Chemical Company
660 Frelinghuysen Avenue
Newark, NJ 07114

Attn: Steven Shopsis

RE: NOTICE OF VIOLATION
PERMIT # 21404463
VIOLATION DATE: 05/11/89
SECTION VIOLATED: 315.2

Dear Mr. Shopsis:

You are put on notice that your company is in violation of Section 315.2 of the Passaic Valley Sewerage Commissioners Rules and Regulation. Mr. Fischer reported in his May 5, 1989 letter that White Chemical's pH probe malfunctioned and was replaced. In addition, the recorder malfunctioned requiring replacement. As a result White Chemical did not comply with Sewer Connection Permit which requires continuous monitoring of the facilities outfall. During the inspection on May 11, 1989, it was verified that all of the reported equipment malfunctions reported during the 4/20/89 to 5/22/89 monitoring period had been corrected.

You are reminded that in the future, we will expect that you pay closer attention to pH control. In addition, in the event of spills, upsets or equipment malfunctions, you must notify PVSC in writing with an explanation and a plan to prevent reoccurrence. Failure to do so could result in fines or other penalties. A copy of this letter is being forwarded to the PVSC attorneys to determine if further action is warranted.

If you have any questions concerning this matter, please call Mario Graglia at (201) 344-1800 ext. 238.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Carmine T. Perrapato
Executive Director

CTP/dr

cc: Robert Davenport, Deputy Executive Director
Frank D'Ascensio
City of Newark

INDUSTRIAL VIOLATION INFORMATION

PERMIT_NO: 21404463.

COMPANY_NAME: WHITE CHEMICAL COMPANY .

LOCATION: 660 FRELINGHUYSEN AVENUE . COMMUNITY: NEWARK .

VIOLATION_DATE: 05/11/89. SECTION_VIOLATED: 315.2 .

DESCRIPTION: PH PROBE MALFUNCTION . FORMAL_NOTICE_SENT: Y.

SKED_ELIMIN: __/__/__. ACTUAL_ELIMIN: 5/31/89.

VISIT1: 5/31/89. COMMENT1: No Response due.

VISIT2: __/__/__. COMMENT2: _____.

VISIT3: __/__/__. COMMENT3: _____.

VISIT4: __/__/__. COMMENT4: _____.

DUE_DATE: _____. REC_DATE: _____. FINE: _____. END_DATE: _____.

ED 9/9/89

1/29/90

Marie,

The following results were submitted in White Chemical - Newark MR2 report covering period 10/1/89 - 12/31/89

Outlet #1 2140446 1

2/1/89	Methylene Chloride	38.3	ppb
"	Chloroform	44.2	ppb
"	Bromodichloromethane	9.2	"
"	Toluene	5.2	"
"	1,2 Dichlorobenzene	5.1	"
"	1,2 Dichloroethane	13.2	"
1/8/89	Chloroform	86.7	"
"	Bromodichloromethane	7.2	"
2/13/89	Chloroform	54	ppb
"	Toluene	34.3	"
"	1,2 Dichloroethane	142	"
"	(p) Xylene	184	"
"	(m) Xylene	39	"
"	Ethylbenzene	24.4	"

MP

White Chemical - Newark (Cont.) 1/29/90

Outlet #2 2140 4462

10/11/89	Methylene Chloride	170 ppb
"	Chloroform	75.4 "
	M, P Xylene	13.2 "
10/25/89	Chloroform	88.7 ppb
	Bromodichloromethane	8.7 "
	M, P Xylene	12.8 "
12/13/89	Chloroform	66.5 ppb

MP.

DATE: 6/18/90
Revision

USER UPDATE

THE FOLLOWING COMPANY/COMPANIES HAS/HAVE LEFT THE SYSTEM. PLEASE MAKE THE NECESSARY CHANGES TO REMOVE FROM YOUR SAMPLING PROGRAM.

Company Name	Permit No.	Location	Date Left System

THE FOLLOWING COMPANY/COMPANIES HAS/HAVE BEEN ADDED TO THE SYSTEM. PLEASE TAKE THE NECESSARY ACTION TO ADD TO YOUR SAMPLING PROGRAM.

Company Name	Permit No.	Location	Date Entered System
UNITE CHEMICAL CORPORATION	2140463	NEWARK	

RIC
THIS REVISION WAS FOR THE ADDITION OF PRETREATMENT REGULATION 40 CFR 414.25 SUBPART G ORGANIC CHEMICALS FOR TWO OUTLETS OUTLETS #1 & 2

2. In addition to the monitoring required in Section C.1. the Permittee is required to meet the following schedule of compliance:

   A. Analysis of wastewater parameters shall be performed by a laboratory that has been certified by the State of New Jersey.

   B. Installation of water meter:

      09/06/88 Water meter to be installed on domestic discharge in building 33.

   C. Pretreatment Compliance Requirements - Organic Chemicals Categorical Pretreatment Standards 40 CFR 414.

      11/05/90 Permittee to be in compliance with Organic Chemicals Categorical Pretreatment Standards 40 CFR 414.75 Subpart G.

      02/05/91 Permittee to submit a Compliance Report to PVSC demonstrating compliance with Organic Chemicals Pretreatment Standards. The report shall be in accordance with General Pretreatment Regulations 40 CFR 403.12 section (d).

      7/21/91 First Periodic Compliance Monitoring Report due. Permittee to submit Periodic Compliance Monitoring Report Semi-Annually January 21 and July 21 in accordance with General Pretreatment Regulations 40 CFR 403.12 section (e).

111 3453

WHITE CHEMICAL CORPORATION

660 FRELINGHUYSEN AVENUE, NEWARK, N.J. 07114
P.O. BOX 2500

TELEPHONE 201-621-4100
TELEFAX 201-621-7096
TELEX 84 41 31

April 17, 1990

Mr. Carmine T. Perrapato
Executive Director
Passaic Valley Sewerage Commissioners
600 Wilson Avenue
Newark, New Jersey 07105

Re: Notice of Violation, dated 3/21/90, Permit #21404463

Dear Sir:

I am in receipt of the notice of violation referenced above.

I have examined the tapes for the February to March period and the excursions noted occured on all three shifts. I have matched up the times and dates to our production records and these indicate that there was no production going on in this building which would have caused any LEL excursions.

The LEL meter appears to have been working properly. I therefore cannot understand these high levels. The sewers are covered to insure that any unauthorized discharge does not take place. I have spoken to the supervisors as well as the production personnel and they are all well aware of not putting anything to the sewer other than our normal allowable discharge.

I have examined the tapes for the month of March and so far in April, I do not see any excursions of LEL for this period.

I am sure, that if the problem stemmed from my production staff any further excursion will not repeat itself.

Sincerely,

Steve Shopsis
Plant Manager

BAE 000019

CHARLES A. LAGOS
CHAIRMAN

RAYMOND LUCHKO
VICE CHAIRMAN

ROBERT M. BURKE, JR.
THOMAS J. CIFELLI
KENNETH W. HAYDEN
FRANK ORECHIO
DONALD TUCKER

COMMISSIONERS

Passaic Valley
Sewerage Commissioners

600 WILSON AVENUE
NEWARK, N.J. 07105
(201) 344-1800
Fax: (201) 344-2951

CARMINE T. PERRAPATO
EXECUTIVE DIRECTOR

ROBERT J. DAVENPORT
DEPUTY EXECUTIVE DIRECTOR

JAMES M. PIRO
CHIEF COUNSEL

NORMAN E. DARMSTATTER
CLERK

April 4, 1990

White Chemical
660 Frelinghuysen Avenue
Newark NJ 07114

Attn: Mr. Steve Shopsis

RE: NOTICE OF VIOLATION
PERMIT NO.: 21404463
VIOLATION DATE: 03/21/90
SECTION VIOLATED: APPENDIX B

Dear Shopsis:

On 03/21/90, a routine inspection was made of your LEL control system. The LEL recorder charts were reviewed for the period 02/01/90 to 03/01/90. The excursions are listed below:

Date		
2/21/90	70%	10 minutes
2/22/90	75%	10 minutes
	45%-60%	15 minutes
2/27/90	45%-50%	20 minutes
	40%-60%	60 minutes

As a result, White Chemical has violated Appendix B Pretreatment Limitation #2 of PVSC's Rules and Regulations.

Please respond to this letter in writing within ten days with a plan designed to eliminate these violations. In the future if you have any questions concerning this matter, please call Mario Graglia at (201) 817-5724.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Carmine T. Perrapato
Executive Director

CTP/sl

cc: Robert Davenport, Deputy Executive Director
Frank D'Ascensio
City of Newark

INDUSTRIAL VIOLATION INFORMATION

PERMIT_NO: 21404463.

COMPANY_NAME: WHITE CHEMICAL COMPANY .

LOCATION: 660 FRELINGHUYSEN AVENUE . COMMUNITY: NEWARK .

VIOLATION_DATE: 03/21/90. SECTION_VIOLATED: APPENDIX B.

DESCRIPTION: EXCEEDED LEL LIMITS . FORMAL_NOTICE_SENT: Y.

SKED_ELIMIN: __/__/__. ACTUAL_ELIMIN: 04/24/90

VISIT1: __/__/__. COMMENT1: Data Submitted.

VISIT2: __/__/__. COMMENT2: _____.

VISIT3: __/__/__. COMMENT3: _____.

VISIT4: __/__/__. COMMENT4: _____.

DUE_DATE: _____. REC_DATE: _____. FINE: _____. END_DATE: _____.

TO_LEGAL: _. SKED_REQ: _.

Closed 4/24/90 4/4/90 DE

FILE MEMORANDUM

TO: WHITE CHEMICAL

FROM: R. QUINTIERI

DATE: NOVEMBER 29, 1990

SUBJECT: TELECOM: 414 STATUS

I spoke with James White who stated all production was stopped as of August 1990. He also stated that the USEPA took over the property in October 1990 and that the EPA contact was Paula Camarata, 621-9488.

I told him to send a letter explaining White Chemical's current status.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
EDISON, NEW JERSEY 08837

Re: White Chemical

DEC 20 1990

Mr. Mario Graglia
Supervisor of Monitoring and Surveillance
Passaic Valley Sewerage Commissioners
600 Wilson Avenue
Newark, New Jersey 07105

Dear Mr. Graglia:

I would like to extend to you our appreciation for your recent visit at the White Chemical site where we are currently conducting a CERCLA (superfund) removal action (cleanup).

We appreciate your staff's concerns regarding our operation at this site and we hope we have provided you with the necessary information regarding our cleanup. I am sure you will agree that since EPA is now on-site, the past threat of chemical dumping into your lines has been alleviated.

Before too much time goes by, I would like to confirm to you that all drains on-site within the work areas have been addressed. Please refer to the attached location map which identifies those drains plugged to ensure in the case of a spill; no chemical will enter the storm drains.

In addition, we have prepared and partially diked the drain in our support (clean) zone where no chemicals are staged. This drain was partially diked because this drain is the catch basin for the rain water in this area. If we were to plug the drain, it would cause severe flooding on the site. Partial diking of this area will allow for rain water to continue its flow and in the event of a worse case scenario, we could easily dike the entire drain.

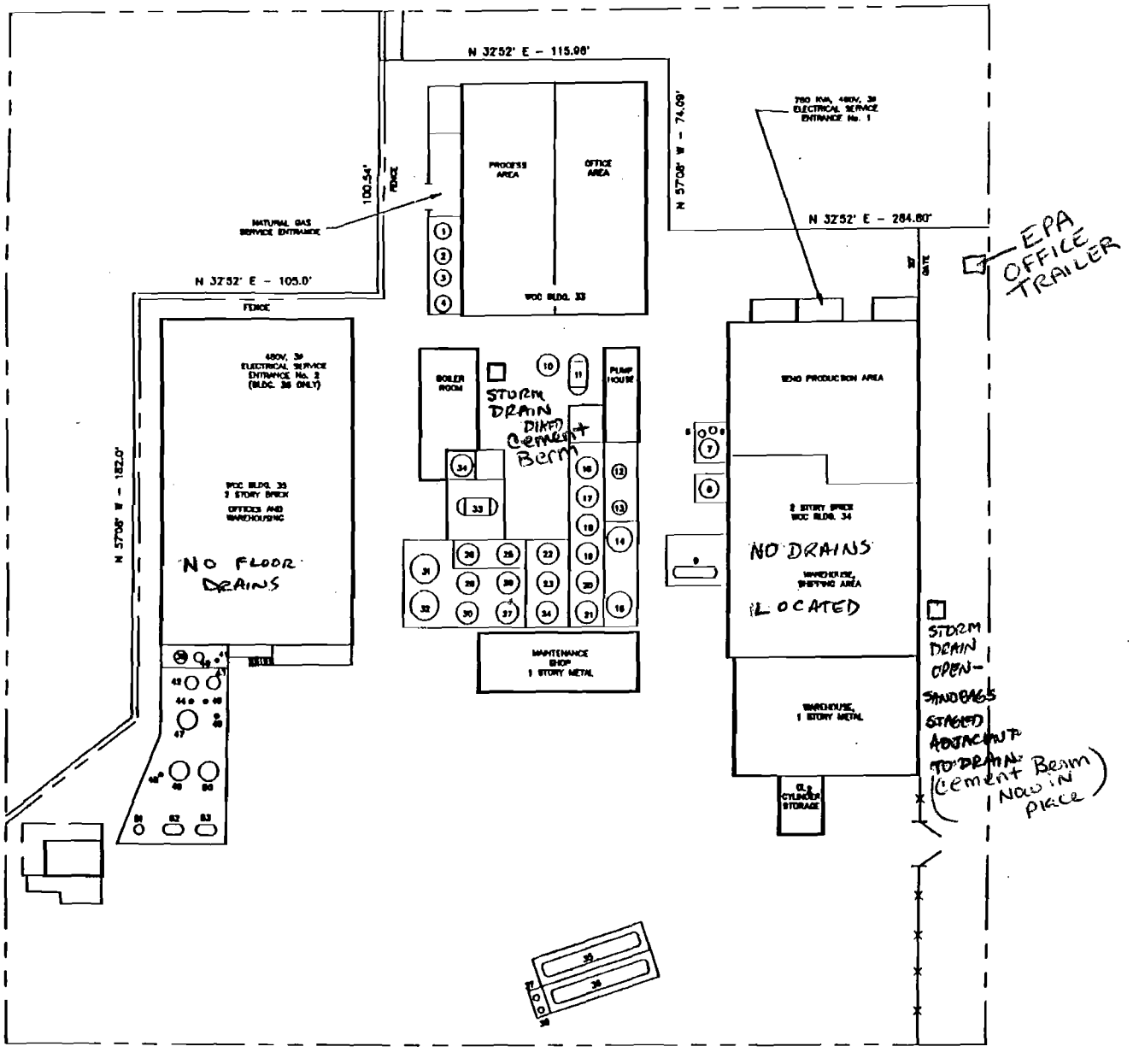
Again, we appreciate your interest at our site and look forward to working with you in the future. Please feel free to contact me at the site at 201-621-9488.

Sincerely,

Paula A. Cammarata

Paula A. Cammarata
On-Scene Coordinator
Removal Action Branch

Printed on Recycled Paper



PLOT No.	WCC VESSEL No.	CONTENTS	NFPA RATING
1	HT3303	30% HCL	
2	HT3304	30% HCL	
3	ST3310	30% HCL	
4	ST3304	30% HCL	
5	HT3410	30% HCL	
6	HT3417	30% HCL	
7	HT3416	30% HCL	
8	HT3414	30% HCL	
9	HT4003	GLYCOL	
10	ST3306		
11	ST3308	FATTY ACID	
12	HT3401	BROMINE	
13	HT3402	BROMINE	
14	ST3901	30% HCL	
15	ST3902	30% HCL	
16	ST3303	CAPRYLIC ACID	
17	ST3410	ETHYLENE DICHLORIDE	
18	ST3304	CAPRYLIC ACID	
19	ST9008	EMPTY	
20	ST9010	EMPTY	
21	ST9011	EMPTY	
22	ST3601	XYLENE	
23	ST9007	EMPTY	
24	ST9009	EMPTY	
25	ST3308	PIVALOYL CHLORIDE	
26	ST9004	EMPTY	
27	ST9006	EMPTY	
28	ST3309	ACETYL CHLORIDE	
29	ST9003	EMPTY	
30	ST9008	EMPTY	
31	ST9001	EMPTY	
32	ST9003	EMPTY	
33	ST3307		
34	HT4004	FUEL OIL	
35	HT3301	PHOS. TRICHLORIDE	
36	HT302	EMPTY	
37	HT3302	EMPTY	
38	ST3301	30% HCL	
39	HT3602	DPX & XYLENE	
40	HT3601	DPX & XYLENE	
41	HT3610	XYLENE	
42	K3602	DPX & XYLENE	
43	K3601	DPX & XYLENE	
44	HT3609	XYLENE	
45	HT3611	40% SULFURIC	
46	HT3608	WATER	
47	K3603	DPX & XYLENE	
48	HT3612	XYLENE	
49	HT3603	XYLENE	
50	HT3604	XYLENE	
51	HT3607	XYLENE	
52	HT3606	XYLENE	
53	HT3605	XYLENE	

0 25 50 75 100

GRAPHIC SCALE FEET

WHITE CHEMICAL CORPORATION, INC.

NEWARK, NEW JERSEY

CONTRACT NO.	DWG. NO. WCC - 100103	REV. 0	SCALE 1"=25'

DWG. TITLE: PROCESS & INSTRUMENTATION DIAGRAM

PROPERTY PLOT

MAIN PLANT AREA

TANKAGE LAYOUT

REFERENCE DRAWINGS

DWG. NO.	TITLE	MK	REVISION	BY	CHK	APP	DATE	MK	REVISION	BY	CHK	APP	DATE

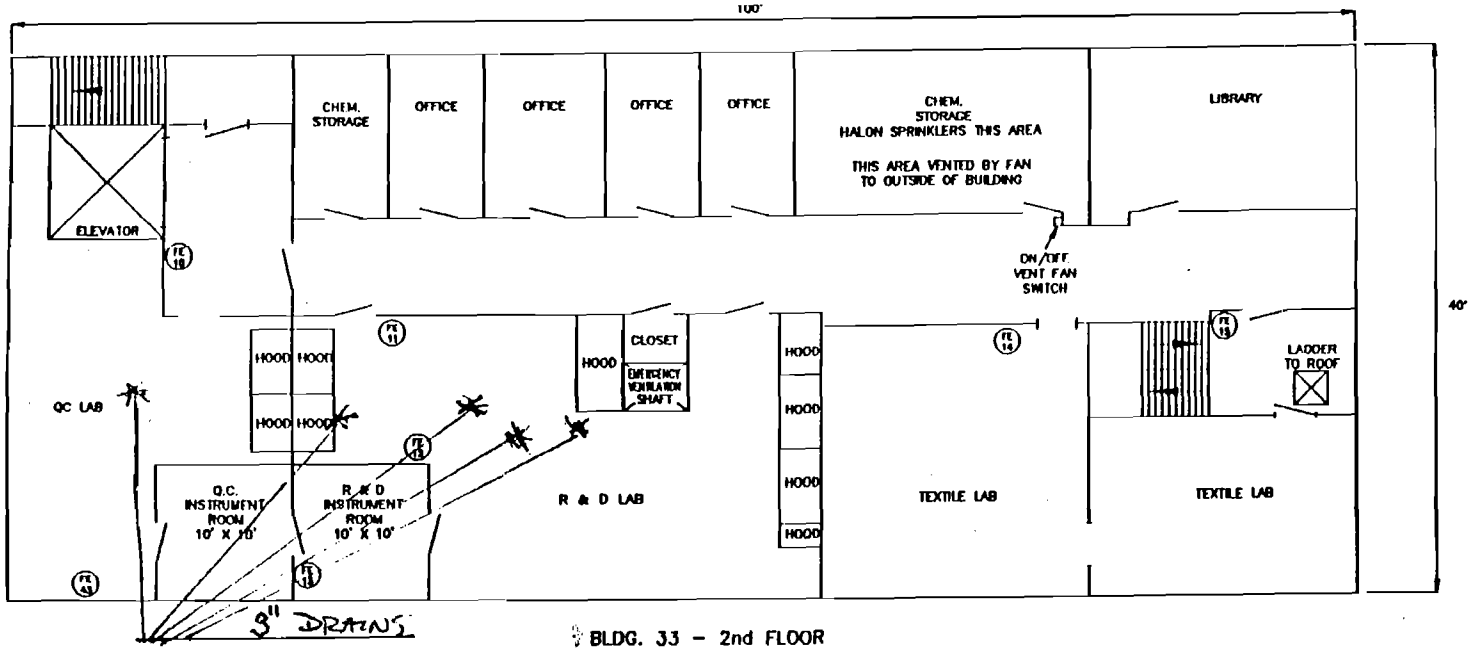
DRAWN: WS DATE: 1/27/88

CHECKED: R. PARKER

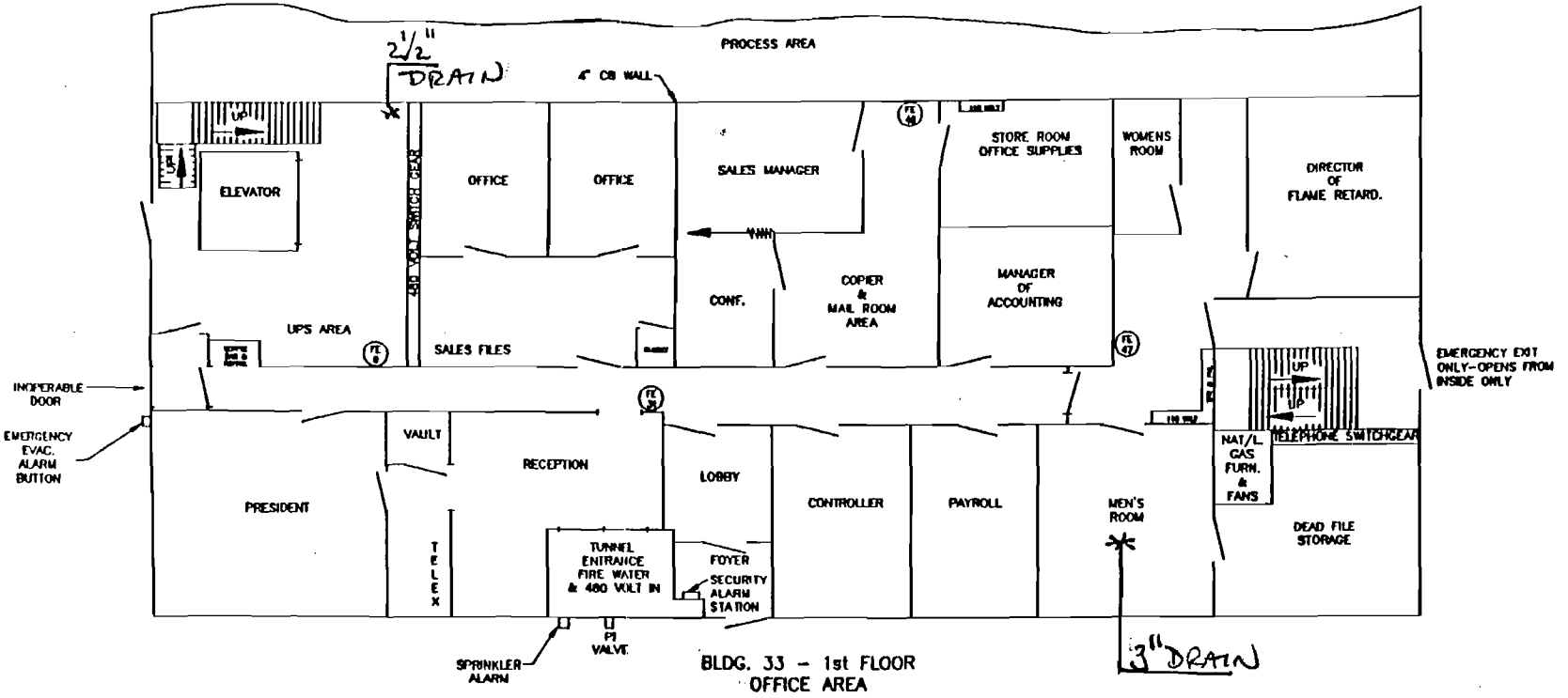
APPROVED: J. WHITE

APPROVED: R. SHOSS

SEAL:



BLDG. 33 – 2nd FLOOR
LAB AREA



BLDG. 33 – 1st FLOOR
OFFICE AREA

FIRE EXTINGUISHERS

No.	TYPE
FE-9	20lb. CODC
FE-10	20lb. CO_2
FE-11	20lb. PDC
FE-12	20lb. HALON
FE-13	20lb. CO_2
FE-14	20lb. CODC
FE-15	20lb. CO_2
FE-31	20lb. PRESS. WATER
FE-43	20lb. CODC
FE-46	20lb. PRESS. WATER
FE-47	20lb. CO_2

NOTES:

1. OFFICE AND LAB AREAS PROTECTED BY "DRY SYSTEM. (LOSS OF AIR PRESS. CAUSES SYST WATER, ALARMS ON-SITE AND AT OFF-SITE
2. STANDPIPE CONNECTION FOR SPRINKLER SYS AT BUILDING 34.
3. FIRES ON SECOND FLOOR REQUIRE FIRE FIGH TO WEAR SELF CONTAINED BREATHING APPAR

WHITE CHEMICAL C
660 FRELINGH
NEWARK, NE

CONTRACT NO. | DWG. NO.

REFERENCE DRAWINGS

DWG. NO.	TITLE	DWG. NO.	TITLE

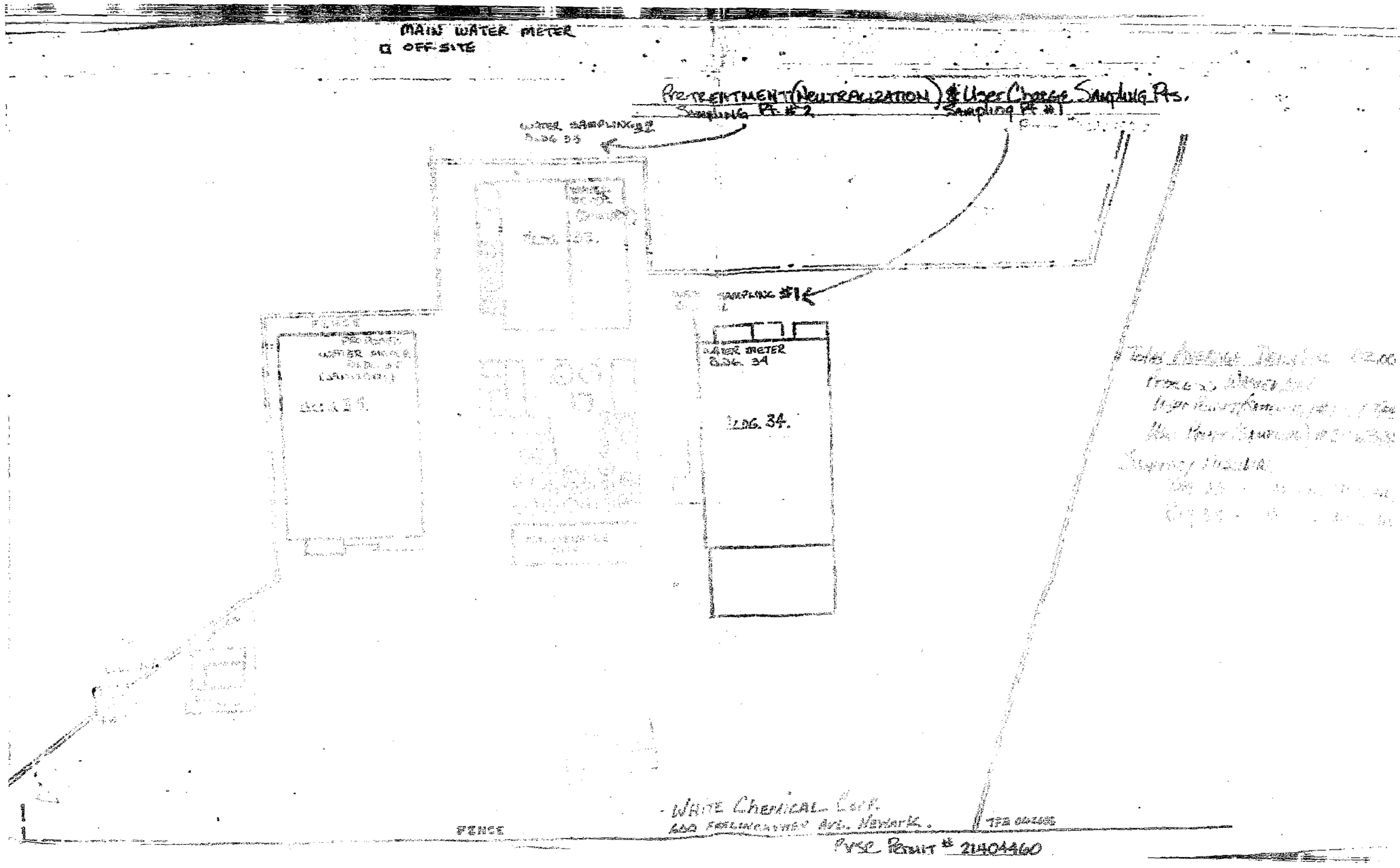
MK	REVISION	BY	CK	APP	DATE

MK	REVISION	BY	CK	APP	DATE

DRAWN W.S. DATE 1/10/89
CHECKED R.M.P.
APPROVED
APPROVED

SEAL

DWG. TITLE
BUILDING 33 –
ADMINISTRATIVE & LA
AND FIRE PROTECTIO


MAIN WATER METER
OFF-SITE
PRETREATMENT (NEUTRALIZATION) & User Charge Sampling Pts.
Sampling Pt. #2
Sampling Pt. #1
WATER SAMPLING #2
BLDG. 33
SAMPLING #1
WATER METER
BLDG. 34
BLDG. 34.
FENCE
WHITE CHEMICAL CORP.
600 FRELINGHUYSEN AVE. NEWARK.
PVSC PERMIT # 21404460

HM-04-90

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT
Lance R. Miller, Acting Director
CN 028
Trenton, N.J. 08625-0028
(609) 633-1408

15 MAR 1990

IN THE MATTER OF WHITE CHEMICAL CORPORATION 660 FRELINGHUYSEN AVENUE NEWARK, NJ 07114 P.O. BOX 2500	: : : : :	ADMINISTRATIVE ORDER AND NOTICE OF CIVIL ADMINISTRATIVE PENALTY ASSESSMENT

This Administrative Order and Notice of Civil Administrative Penalty Assessment is issued pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection (hereinafter "NJDEP" or the "Department") by N.J.S.A. 13:1D-1 et seq., and the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq. and duly delegated to the Assistant Director for Enforcement of the Division of Hazardous Waste Management pursuant to N.J.S.A. 13:1B-4.

FINDINGS

1. The Department has determined that White Chemical Corporation (hereinafter "White Chemical") is a generator of hazardous waste (EPA ID# NJD 980755623) as defined in N.J.A.C. 7:26-1.4 and is located at Block 107, Lot 3782, 660 Frelinghuysen Avenue, Newark, Essex County, State of New Jersey.

2. An inspection was conducted on September 8, 1989 and the Department determined White Chemical to be in violation of the following;

   a. White Chemical failed to ship hazardous waste off-site to an authorized facility or place in an on-site authorized facility, as defined at N.J.A.C. 7:26-1.4, within ninety (90) days or less. Specifically, White Chemical stored twenty-four (24) drums of ethylene dichloride in the processing area and over one thousand (1000) drums of hazardous waste in the waste storage area for over ninety (90) days, in violation of N.J.A.C. 7:26-9.3(a)1.

   b. White Chemical failed to mark clearly and make visible for inspection the date upon which each period of accumulation begins and label with the words "Hazardous Waste" on each container. Approximately twenty-four (24) drums of ethylene dichloride in the process areas were not labeled, in violation of N.J.A.C. 7:26-9.3(a)3.

position
N.J.A.C.

BAF000004

c. White Chemical failed to transfer hazardous waste in a container that is not in good condition to a container that is in good condition. Approximately, one thousand (1000) drums of hazardous waste located at the eastern end of the property, adjacent to the railroad tracks, were corroded and waste was not transferred to containers in good condition, in violation of N.J.A.C. 7:26-9.4(d)2.

d. White Chemical failed to securely close drums of hazardous waste so that there was no escape of hazardous waste or its vapors. Approximately one thousand (1000) drums of hazardous waste located at the eastern end of the property, adjacent to the railroad tracks, were missing tops and emitted fumes, in violation of N.J.A.C. 7:26-9.4(d)4i.

e. White Chemical opened, handled, or stored containers holding hazardous waste in a manner which caused the containers to rupture or caused them to leak. Specifically, there are many leaking and ruptured drums of hazardous waste and is evidence of spillage throughout the eastern end of the property, adjacent to the railroad tracks, in violation of N.J.A.C. 7:26-9.4(d)4iii.

f. White Chemical failed to arrange every container so that its identification label is visible. Specifically, all drums of hazardous waste located in the eastern end of the property, adjacent to the railroad tracks, were not labeled, in violation of N.J.A.C. 7:26-9.4(d)4v.

g. White Chemical failed to inspect areas where containers are stored, at least daily, looking for leaks and for deterioration caused by corrosion or other factors, in violation of N.J.A.C. 7:26-9.4(d)5.

h. White Chemical failed to store containers holding ignitable or reactive waste at least 50 feet (15 meters) from the facility's property line. Specifically, drums containing various types of hazardous waste located at the eastern end of the property, adjacent to the railroad tracks are stored less than 50 feet from the facility's property line, in violation of N.J.A.C. 7:26-9.4(d)6.

i. White Chemical failed to maintain records of job titles of each position at the facility related to hazardous waste management, and the name of the employee filling each job, in violation of N.J.A.C. 7:26-9.4(g)6i.

j. White Chemical failed to maintain documents of the written job description for each position related to hazardous waste management, in violation of N.J.A.C. 7:26-9.4(g)6ii.

k. White Chemical failed to maintain records of the written description of the type and amount of both introductory and continuing training that will be given to each person filling a position related to hazardous waste management, in violation of N.J.A.C. 7:26-9.4(g)6iii.

l. White Chemical failed to maintain training records on current personnel and training records of former employees for at least three years from the date the employee last worked at the facility, in violation N.J.A.C. 7:26-9.4(g)7.

m. White Chemical failed to maintain proper aisle space to allow unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation. Specifically, proper aisle space was not maintained between hazardous waste drums at the eastern end of the property, adjacent to the railroad tracks, in violation of N.J.A.C. 7:26-9.6(e).

n. White Chemical failed to make arrangements to familiarize local hospitals with the properties of hazardous waste handled at the facility and the types of injuries or illnesses which could result from fires, explosions, or discharges at the facility, in violation of N.J.A.C. 7:26-9.6(f)4.

o. White Chemical failed to make arrangements to have the local fire department inspect the facility on a regular basis with at least two (2) inspections annually, in violation of N.J.A.C. 7:26-9.6(f)5.

p. White Chemical failed to describe in its contingency plan, pursuant to N.J.A.C. 7:26-9.7(a) and 9.3(a)4, the actions facility personnel shall take to comply with paragraphs N.J.A.C. 7:26-9.7(a), 9.7(b), and 9.7(e) in response to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste constituents to air, soil, or surface water at the facility, in violation of N.J.A.C. 7:26-9.7(c)..

q. White Chemical failed to include in the contingency plan a list of all emergency equipment at the facility where this equipment is required, in violation of N.J.A.C. 7:26-9.7(g).

r. White Chemical caused, suffered, allowed or permitted the construction, installation, modification, or operation of a hazardous waste faciltiy without being authorized by the Department to operate as a hazardous waste facility and without being exempt from the requirement to have a permit. Specifically, White Chemical is distilling spent ethylene dichloride, without receiving a permit authorizing them as an existing facility or without being exempt from the permit requirement, in violation of N.J.A.C. 7:26-12.1(a).

3. A reinspection was conducted on September 22, 1989, and the Department determined that White Chemical has attained compliance with the following provisions: N.J.A.C. 7:26-9.3(a)3, 9.4(d)5, 9.4(g)6i, 9.4(g)6ii, 9.4(g)6iii, 9.4(g)7, 9.6(e), 9.6(f)4, 9.6(f)5, 9.7(c) and 9.7(g).

4. During the above mentioned reinspection, it was also noted that White Chemical had not attained compliance with the following provisions: N.J.A.C. 7:26-9.3(a)1, 9.4(d)2, 9.4(d)4i, 9.4(d)4iii, 9.4(d)4v, 9.4(d)6, and 12.1.(a).

5. Based on the facts set forth in these FINDINGS, the Department has determined that White Chemical has violated the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq. and the regulations promulgated pursuant thereto, N.J.A.C. 7:26-1 et seq., specifically N.J.A.C. 7:26-9.3(a)1, 9.3(a)3, 9.4(d)2, 9.4(d)4i, 9.4(d)4iii, 9.4(d)4v, 9.4(d)5, 9.4(d)6, 9.4(g)6i, 9.4(g)6ii, 9.4(g)6iii, 9.4(g)7, 9.6(e), 9.6(f)4, 9.6(f)5, 9.7(c), 9.7(g), and 12.1.(a).

ORDER

NOW, THEREFORE, IT IS HEREBY ORDERED THAT WHITE CHEMICAL SHALL:

6. Within twenty (20) calendar days upon receipt of this Administrative Order and Notice of Civil Administrative Penalty Assessment submit the enclosed VERIFICATION OF COMPLIANCE by certified mail, return receipt requested or by hand delivery to the address below, indicating that you have corrected the violations referenced in paragraph 4 above.

New Jersey Department of Environmental Protection
Division of Hazardous Waste Management
Bureau of Compliance and Technical Services
CN 028
Trenton, NJ 08625
Attention: Christina H. Purcell

THIS ORDER SHALL BE EFFECTIVE UPON RECEIPT.

NOTICE OF CIVIL ADMINISTRATIVE PENALTY ASSESSMENT

7. Pursuant to N.J.S.A. 13:1E-9e and based upon the above FINDINGS, the Department has determined that a civil administrative penalty should be assessed against White Chemical in the amount of $86,500.00.

8. Payment of the penalty is due when a final order is issued by the Commissioner subsequent to a hearing, if any, or when this Notice of Civil Administrative Penalty assessment becomes a final order (see following paragraph). Payment shall be made by certified check payable to "Treasurer, State of New Jersey" and shall be submitted to:

New Jersey Department of Environmental Protection
Division of Financial Management Planning and General Services
Bureau of Revenue
CN 402
Trenton, NJ 08625

9. If no request for a hearing is received within twenty (20) calendar days from receipt of this Notice of Civil Administrative Penalty Assessment, it shall become a final order upon the twenty-first calendar day following its receipt and the penalty shall be due and payable.

NOTICE OF RIGHT TO A HEARING

10. Pursuant to N.J.S.A. 52:14B-1 et seq. and N.J.S.A. 13: 1E-9, White Chemical is entitled to an administrative hearing. Any hearing request shall be delivered to the address below within twenty (20) calendar days from receipt of this Administrative Order and Notice of Civil Administrative Penalty Assessment.

Assistant Director for Enforcement
Division of Hazardous Waste Management
401 East State Street
CN 028
Trenton, New Jersey 08625
Attention: Wayne C. Howitz, Assistant Director

11. White Chemical shall, in its request for a hearing, furnish NJDEP with the following:

a. A statement of the legal authority and jurisdiction under which the hearing or action to be taken is to be held;

b. A reference to the particular sections of the statute and rules involved;

c. A short and plain statement of the matters of fact and law asserted; and

d. The provisions of this Administrative Order and Notice of Civil Administrative Penalty Assessment to which White Chemical objects, the reasons for such objections, and any alternative provisions proposed.

GENERAL PROVISIONS

12. This Administrative Order and Notice of Civil Administrative Penalty Assessment is binding on White Chemical, its principals, directors, officers, agents, successors, assigns, any trustee in bankruptcy or other trustee, and any receiver appointed to a proceeding in law or equity.

13. Notice is given that violations of any statutes, rules or permits other than those herein cited may be cause for additional enforcement actions, either administrative or judicial. By issuing this Administrative Order and Notice of Civil Administrative Penalty Assessment the Department does not waive its right to initiate additional enforcement actions.

14. No obligations imposed by this Administrative Order and Notice of Civil Administrative Penalty Assessment (with the exception of paragraph (7) above) are intended to constitute a debt, damage claim, penalty or other civil action which should be limited or discharged in a bankruptcy proceeding. All obligations are imposed pursuant to the police powers of the State of New Jersey, intended to protect the public health, safety, welfare, and environment.

15. Notice is given that pursuant to N.J.S.A. 13:1E-9e, the Department is authorized to assess a civil administrative penalty of not more than $25,000 for each violation and additional penalties of not more than $2,500 for each day during which the violation continues.

16. Notice is further given that pursuant to N.J.S.A. 13:1E-9f, any person who violates N.J.S.A. 13:1E-1 et seq. or any code, rule, or regulation promulgated thereunder shall be liable to a penalty of not more than $50,000 per day of such violation, and each day's continuance of the violation shall constitute a separate violation.

17. Notice is further given that pursuant to N.J.S.A. 13:1E-9f, any person who violates an administrative order issued pursuant to N.J.S.A. 13:1E-9c, or a court order issued pursuant to N.J.S.A. 13:1E-9d, or who fails to pay a civil administrative penalty in full after it is due shall be subject upon order of a court to a civil penalty not to exceed $100,000 per day of such violation and each day's continuance of the violation shall constitute a separate violation.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: _____
Wayne C. Howitz
Assistant Director
Hazardous Waste Enforcement

REC'D:
TO DR.WCH/chp
WITHDRAWN:
DKT. #:
DATE OF HEARING:
ALJ TO DEA:
COMMENTS:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

In the Matter of	
White Chemical Corporation and Mr. James White	ADMINISTRATIVE ORDER DIRECTING COMPLIANCE WITH REQUEST FOR ACCESS
Proceeding under Section 104(e) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. Section 9604(e).	Index No. II CERCLA-00117

JURISDICTION

1. The following Administrative Order is issued to James White ("Respondent") and White Chemical Corporation pursuant to the authority vested in the President of the United States by §104(e)(5) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), as amended, 42 U.S.C. §9604(e)(5), which authority was delegated to the Administrator of the United States Environmental Protection Agency ("EPA") on January 23, 1987, by Executive Order 12580, and further redelegated to the Regional Administrator of EPA on April 17, 1987.

PARTIES BOUND

2. This Order shall apply to and be binding upon the Respondent, and each and every agent of the Respondent and upon all other persons and entities who are under the direct or indirect control of the Respondent.

FINDINGS OF FACT AND CONCLUSIONS OF LAW

3. Respondent, James White, is a person as that term is defined in §101(21) of CERCLA, 42 U.S.C. §9601(21).

4. Respondent is a tenant in possession of real property ("property") located at Block 3782, Lot 107, 660 Frelinghusysen Avenue, Newark, New Jersey.

5. Respondent is an "operator," as that term is defined in §101(20)(A) of CERCLA, 42 U.S.C. §9601(20)(A), of the White Chemical Corporation, a manufacturer of acid chlorides, alkyl bromides, and flame retardant compounds.

6. The Respondent's property and corporation constitute a "facility" as that term is defined in § 101(9) of CERCLA, 42 U.S.C. §9601(9).

7. The property on which Respondent operates is owned by Lancaster Chemical Corporation, a division of AZS Corporation. AZS Corporation is located at 6025 Sandy Springs Circle, Atlanta, Georgia. Tosch ("U.S.A."), formerly Toyo Soda Corporation, (hereinafter "Tosch"), is the parent corporation of AZS and is located at 1700 Water Place, Atlanta, Georgia.

8. On September 8, 1989, the New Jersey Department of Environmental Protection ("NJDEP") conducted an inspection at Respondent's facility pursuant to the Resource Conservation and Recovery Act of 1976 ("RCRA") and issued Notice of Violations for the following hazardous waste violations: improper drum management, leaking drums, open containers, and inadequate aisle space. A reinspection of the facility on September 22, 1989, noted that the facility had attained only partial compliance, and as a result, an Administrative Order and penalty in the amount of $86,500 was issued on March 15, 1990. According to NJDEP, the respondent has not complied with the order and has not paid the amount requested.

9. On March 27 through 29, 1990, the NJDEP reinspected the facility and took a complete inventory of drums at the site. The inventory showed 9,063 improperly stored, ruptured and leaking drums, containing flammable liquids, acids, and flame retardant compounds, including but not limited to toluene, xylene, acetone, ethylene-dichloride, and trichloroethylene ("TCE"). These substances are "hazardous substances" as defined in §101(14) of CERCLA, 42 U.S.C. §9601(14).

10. During NJDEP's visit of March, 1990, many drums containing unknown substances and hazardous wastes were observed to be improperly stored and in excess of the RCRA 90-day limit for storage of hazardous waste without a permit. As a result, the NJDEP issued Notice of Violations ("NOVs") under the New Jersey

Spill Compensation and Control Act and ordered Respondent to immediately remediate the spills and improper drum storage. According to the NJDEP, the Respondent has failed to comply with these NOVs.

11. On May 8, 1990, NJDEP issued a Directive to the Respondent pursuant to the N.J. Spill Compensation and Control Act, in order to secure the perimeter of the facility, supply 24 hour per day security, and stabilize the 9,063 drums at the site. Supplemental Directives were issued on June 15, 1990, and July 18, 1990, ordering Respondent to remove 2,500 empty drums as part of site stabilization, and remove 1,282 drums containing hazardous substances. According to the NJDEP, the Respondent has failed to comply with the requirements of the issued directives.

12. Also on May 8, 1990, the NJDEP initiated a publicly funded cleanup pursuant to the N.J. Spill Compensation and Control Act which resulted in the removal of the following CERCLA hazardous substances: 130 drums of toluene, xylene, acetone; 389 drums of ethylene-dichloride; 161 drums of TCE; and 376 drums of contaminated filter cake.

13. On September 7, 1990, at NJDEP's request, EPA accompanied NJDEP to conduct an initial assessment of the site for removal consideration under CERCLA, and the National Contingency Plan ("NCP") §300.412.

14. EPA's inspection of Respondent's facility confirmed that extremely dangerous and highly volatile chemical compounds exist in an unsecured state, and that an imminent and substantial danger is posed to the health and safety of Respondent's employees who remain at the facility, employees at adjacent commercial facilities, residents who reside in several large public housing projects and a senior citizens' home, both located within a quarter mile of the site, persons who recreate in the county park across the street from the facility, and others who are in close proximity to the facility.

15. During EPA's inspection of Respondent's facility, EPA conducted air sampling which indicated that sulphuric acid is migrating off-site, posing a health risk to employees of adjacent facilities, and the aforementioned persons who reside within close proximity to the site.

16. In addition, EPA observed and verified NJDEP's current inventory list of approximately 9000 fifty-five gallon drums. About 90% of the drums were stored on the Respondent's property outside of the buildings where the Respondent worked, in close proximity to adjacent facilities and the aforementioned persons. Several thousand of these drums contain air and water reactive chemicals which are stored in open containers and deteriorated and ruptured drums. NJDEP submitted photos to EPA which offer

proof that large toxic vapor clouds form during inclement and humid weather due to nature of the air and water reactive chemicals in the open containers and drums. In addition, EPA observed over 100 cylinders, tanks, vats, carboys, boxes, many of which are in deteriorating and leaking condition.

17. Specific observations of EPA regarding the facility's inventory of drums, containers, cylinders, tanks, vats, carboys, and boxes, support a determination that Respondent and all associated employees and personnel must evacuate the facility during removal activities. These observations are as follows:

1) unsegregated, incompatible chemicals (e.g., corrosives and flammables) stored in close proximity, thereby creating a risk of a fire or explosion in the event of chemical interaction during removal;

2) unlabeled and multilabeled drums and containers, creating confusion as to the drums and containers contents; this uncertainty could result in a mishandling of the drums and containers during removal, thereby increasing the risk of a fire or explosion.

3) storage of ignitable waste within 50 feet of the property line;

4) open containers emitting fumes and open containers consisting of multiphased hazardous waste;

5) numerous spills of hazardous substances on the ground;

6) numerous overpaked drums labeled, "salvage hazardous waste rejected".

18. Approximately 1000 lab pack size containers of hazardous waste material, some appearing to have crystalized (e.g., shock sensitive) materials, are present in two active laboratories at the facility. The extremely volatile nature of the crystalized materials warrants a complete evacuation of the lab during EPA's removal activities in the laboratories, and cessation of Respondent's business operations until removal activities are completed.

19. According to the City of Newark's Office of Emergency Management ("OEM"), the Newark Fire Department and NJDEP's Emergency Response Team has been called to the site numerous times as a result of complaints from employees of adjacent commercial facilities concerning noxious fumes emanating from the site, and spills occurring at the site. According to OEM, on at least two occasions a commercial manufacturer, adjacent to the northern portion of the site, had to close business operations due to its worker's experiencing sickness and nausea from fumes being released from Respondent's site.

20. On September 26, 1990, EPA drafted a first Action Memorandum for CERCLA removal under its response authority of Section 104(a)(1) of CERCLA, 42 U.S.C. §104)a)(1), requesting funds for CERCLA removal activities at the site.

21. The Respondent's Property is, for the purposes of §104(e)(1)(3)(4) of CERCLA, 42 U.S.C. §9604(e)(1)(3)(4), a place where entry by and on behalf of EPA is necessary to determine the need for further response action(s) or the appropriate response action(s) and to effectuate a response action(s) under CERCLA. Specifically, EPA needs full and unrestricted access to the Respondent's site, including but not limited to, chemical manufacturing laboratories inside the Respondent's buildings, and areas outside the buildings for the purpose of conducting response activities which EPA deems necessary to address the threat to the public health, welfare or the environment posed by releases or threatened releases of hazardous substances at the site, from the day of commencement of the removal action and for such time as is reasonably necessary to complete such activities.

22. On September 26, 1990, EPA received from Respondent a written Consent for Access form which allows EPA to perform the following: implement site security (fence and gate), collect and analyze soil, water and air samples, stabilization of the site by performance of removal activities, and recycling and disposal of hazardous and non-hazardous materials.

23. On September 28, 1990, the Agency for Toxic Substances and Disease Registry (ATSDR), at the request of EPA, entered the facility to perform a health consultation and assess the threat of endangerment which Respondent's facility poses to the health and safety of the employees at adjacent commercial facilities. ATSDR concurred with EPA's determination that Respondent's facility poses an imminent and substantial danger to the health and safety of employees at adjacent facilities. During this walk-thru of Respondent's facility, both EPA and ATSDR observed numerous fuming drums and experienced noxious odors emanating from the facility.

DETERMINATION

24. Based on the FINDINGS and CONCLUSIONS set forth above and the entire administrative record, the Regional Administrator has determined that there is a reasonable basis to believe (i) that there may be a release or threat of release of a hazardous substance or pollutant or contaminant; (ii) that full and unrestricted access to the property is needed in order for EPA to take response actions necessary to address the threat to public health, welfare or the environment posed by the releases or threatened releases of hazardous substances at the site, from the day of commencement of the removal action and for such time as is reasonably necessary to complete such activities; (iii) that EPA is authorized to enter the Property pursuant the statutory provisions in §104(e) of CERCLA, 42 U.S.C. §9604(e); and (iv) that due to the extremely volatile and dangerous nature of the hazardous substances at the site, and the possibility of fire or explosion occurring in the laboratories or elsewhere on the site

during removal activities, the Respondent must cease all chemical manufacturing, work, research or other activities at the facility, and completely evacuate all personnel from the facility, from the day of commencement of the removal action, and for such time as is reasonably necessary to complete such activities.

ORDER

25. Based upon the foregoing FINDINGS AND DETERMINATION, IT IS HEREBY ORDERED that Respondent and any and all employees, agents, and all other persons under the direct or indirect control of Respondent, in accordance with paragraph 33, shall cease all chemical manufacturing, work, research or other activities at the facility, and completely evacuate all personnel from the facility, from the day of commencement of the removal action, and for such time as is reasonably necessary to complete such activities.

26. Respondent shall afford EPA, its officers, employees, or representatives, including but not limited to contractors and subcontractors, full and unrestricted access to all areas of the site for the purpose of conducting response activities which EPA deems necessary to address the release or threat of release of a hazardous substance pollutant or contaminant, from the effective date of this Order and for such time as is reasonably necessary to complete such activities.

27. Respondent and any and all employees, agents, and all other persons under the direct or indirect control of Respondent shall not interfere in any way with EPA's response activities described above, including entry onto the property unless Respondent has received written authorization from EPA, complies with all health and safety requirements, and is accompanied by a representative of EPA. Any such interference shall be deemed a violation of this Order.

28. This Order and all of its terms and provisions shall remain in effect until such time that all of the removal activities for the Site are completed and Respondent is notified of such completion in writing by the Director of the Emergency and Remedial Response Division, EPA - Region II.

29. Nothing herein shall constitute or be construed as a satisfaction or release from liability with respect to any conditions or claims arising as a result of past, current or future operations, ownership or use of the site by Respondent, its agents, contractors, successors or assigns.

30. Nothing contained in this Order shall affect any right, claim, interest, defense or cause of action of EPA with respect to Respondent or any third parties.

31. Nothing in this Order shall affect in any manner the right of EPA to issue any other Orders to the Respondent or to any other parties under CERCLA which relate to this Site.

32. Nothing herein shall preclude EPA from taking any additional enforcement actions, and/or other actions as it may deem necessary for any purposes, including but not limited to the prevention or abatement of an imminent and substantial danger to the public health, welfare or the environment arising from conditions at the Site, and recovery of costs thereof.

NOTICE OF INTENTION TO COMPLY

33. Due to the imminent and substantial danger posed by Respondent's facility, this Administrative Order shall become effective on October 2, 1990. Respondents and all employees, agents, and all other persons under the direct or indirect control of Respondent, shall evacuate from the facility and cease operations at the facility by the effective date of this Order. On or before the effective date of this Administrative Order, Respondent shall provide written notice to EPA, certified return receipt requested, stating whether Respondent intends to comply with the terms of this Order. Such written notice shall be sent to, Bruce Aber, Assistant Regional Counsel, Office of Regional Counsel, U.S. Environmental Protection Agency, Region II, 26 Federal Plaza, Rm 309, New York, N.Y. 10278. In the event that Respondent fails to provide such notice, Respondent shall be deemed not to have complied with the terms of this Administrative Order.

PENALTIES FOR NONCOMPLIANCE

33. Respondent is hereby advised that, pursuant to §§104(e)(5), 106(a), and 107(a) of CERCLA, as amended, 42 U.S.C. §§9604(e)(5), 9606(a) and 9607 (a), respectively, a court may assess civil penalties of up to $25,000 per day and other civil damages for each day that Respondent fails to comply with this Administrative Order or any part thereof.

U.S. ENVIRONMENTAL PROTECTION AGENCY

Constantine Sidamon-Eristoff
Regional Administrator
U.S. Environmental Protection Agency
Region II

9/28/90
Date of Issuance

EXPRESS MAIL
RETURN RECEIPT

Roger A. Greenbaum, Esq.
Greenbaum Rowe Smith Raven Davis & Bergstein
Metro Corporate Campus One
P.O. Box 5600
Woodbridge, N.J. 07095-0988

Re: White Chemical Corporation Site

Dear Mr. Greenbaum:

On Friday, September 28, 1990 the United States Environmental Protection Agency, in conjunction with the Agency for Toxic Substances and Disease Registry (ATSDR), and with the written permission of Mr. White, entered the White Chemical Corporation Site (Site) to conduct further evaluations of conditions at the facility.

After a careful evaluation of the conditions at the facility, and with input from ATSDR, EPA has determined that the threat to public health and safety posed by White's facility is so imminent and substantial that the only effective way to ensure everyone's safety is to issue the enclosed Unilateral Administrative Order which requires that Mr. James White and all his personnel evacuate themselves from the facility and cease all business and any other operations. The enclosed Order has been issued to you pursuant to the authority of Section 104(e) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 ("CERCLA"), as amended, 42 U.S.C. §9604(e).

Please be advised that the enclosed Order shall become effective 12:00 A.M., Tuesday, October 2, 1990.

This action is necessary in order to ensure the safety of EPA personnel and contractors, who will be performing removal activities at the facility, as well as Mr. White and his employees, employees at adjacent commercial facilities, residents who reside in close proximity to the facility, and others who are in close proximity to the facility.

If you have any questions please feel free to contact me at (212) 264-5547.

Sincerely yours,

Bruce H. Aber
Assistant Regional Counsel

Enclosure

cc: Kenneth S. Goodkind, Esquire
Mr. James White

JAN 25 1991

CERTIFIED MAIL
RETURN-RECEIPT REQUESTED

Jack Sheehan, Esq.
Director of Environmental Services
Rhone-Poulenc Basic Chemical Co.
One (1) Corporate Drive
Shelton, CT. 06484

Re: White Chemical Corporation Site
Newark, New Jersey
Transfer of Product

Dear Mr. Sheehan:

As per your request, and with the approval of Mr. James White, the United States Environmental Protection Agency (EPA) agrees to allow you to enter the White Chemical Corporation Site for the purpose of assisting EPA in sampling, cleaning and draining two tanks which contain approximately 1200 gallons of product containing or composed of hazardous substances for a productive use. The product is composed of the highly reactive phosphorous trichloride (PCL3), manufactured by Rhone-Poulenc. It is our understanding that you will bring your own tanker trucks to transfer and remove the phosphorous trichloride off-site to your own facility in Tennessee.

As we discussed previously, EPA acknowledges that your agreement to sample, clean, drain and remove this product neither constitutes an admission of liability nor acts as a waiver of any of the rights or remedies available to Rhone-Poulenc at law or in equity regarding conditions at the Site. However, as I previously informed you in our phone conversation on or about December 18, 1990, EPA's permission for you to enter the Site to conduct the above-mentioned activities does not constitute a waiver of any of the rights, remedies, or enforcement options available to EPA at law or in equity regarding conditions at the Site.

Be aware that EPA will not be held out as a party to any contract entered into by or on behalf of Rhone-Poulenc in carrying out the above-mentioned activities. Nor shall Rhone-Poulenc be considered an agent of the United States in carrying out such activities.

Furthermore, EPA will not assume any liability for any injuries or accidents that may occur during Rhone Poulenc's activities at

the above-mentioned Site. Moreover, EPA shall not agree to indemnify, save and hold harmless Rhone-Poulenc and its officers, agents, employees, contractors, subcontractors, and representatives, for or from any and all claims or causes of action arising from, or on account of, acts or omissions of Rhone-Poulenc, its officers, agents, employees, contractors, subcontractors, and representatives, in carrying out the above-mentioned activities.

If you have any questions please feel free to contact me.

Sincerely yours,

Bruce H. Aber
Assistant Regional Counsel

cc: Paula Cammarata, EPA On-Scene Coordinator

NOTES REGARDING THE MEETING BETWEEN EPA AND RHONE POULENC, MANUFACTURES OF PHOSPHORUS TRICHLORIDE STORED AT THE WHITE CHEMICAL SITE.

Date: December 13, 1990
Time: 0900

ATTENDEES:

Paula Cammarata, EPA
Ed Makarewicz, EPA
James Kerr, TAT
Michael Campbell, OHM
Jeff Bodi, OHM
Eugene Disanto, OHM
Dan Carr, Rhone Poulenc
Cliff Malarek, Rhone Poulenc, Stelton Ct.
(203) 925-3449
Bruce Carabelli, Rhone Poulenc, Morrisville, Pa.
(215) 295-7132

Mr. Malarek represented Rhone Poulenc. Mr. Carr is a member of Rhone Poulenc's Environmental Dept. Mr. Carabelli is a production supervisor for the manufacture of Phosphorus Trichloride (PCl3).

Mr. Malarek informed EPA that White Chemical purchased the PCl3 through a Mountain Lakes, New Jersey chemical intermediate supply company. The company name and its president is:

HEXAGON ENTERPRISES
MR. LEE SMITH, PRESIDENT
(201) 263-2600

Hexagon Enterprises used White Chemical to convert the PCl3 to Hexagon products.

Rhone Poulenc recently shipped three 60 lbs "sample size" containers of Phosphorus Anhydride to White Chemical. During the Hot zone entry TAT showed Bruce Carabelli the location of these containers and Mr. Carabelli said that Rhone Poulenc would remove these containers as well as the PCl3.

Mr. Malarek stated that Rhone Poulenc normally ships PCL3 in 3,000 gallon lots. The last purchase of PCl3 by White Chemical was in Spring of 1990. In recent history Rhone Poulenc has delivered Three or four loads of PCl3 to this site. He also noted that Rhone Poulenc has purchased Pivaloyl Chloride and Caproyl Chloride from White Chemical.

Rhone Poulenc requested that EPA ORC draft a letter outlining Rhone Poulenc's <u>volunteer</u> efforts and eagerness to assist the EPA.

Jean Carver, an Environmental Engineer with Rhone Poulenc, will be the lead Rhone Poulenc person during the transfer operation. EPA has requested that Rhone Poulenc supply a work plan outlining the

operation that will be undertaken to remove the PCl3. Matlack Transportation Co. is Rhone Poulenc's dedicated transporter. Details as to where the product will be shipped and when the transfer will occur are still being decided by Rhone Poulenc. The transfer will most likely occur during the middle of January 1991.

13 Dec 90

Meeting with Rhone Poulenc
Regarding PCl_3 Tanks at
White Chemical, 660 Frelinghuysen Ave
Newark New Jersey.

James Kerr EPA Tech. Assistance Team
Michael Campbell, OHM
Dan Carr, Rhone Poulenc
Cliff MALAREK Rhone Poulenc
Bruce Carabelli Rhone Poulenc
Eugene Disanto, OHM
Jeff Bodi OHM
ED MAKarewicz EPA
Paula Caumarata EPA OSC

0900

Rhone Poulenc meeting 13 Dec 90

Jim Kerr, TAT
Michael Campbell OHM
Dan Carr Rhone-Poulenc
Cliff Macaren Rhone Poulenc, Shelton CT (203) 925-3744
Bruce Carabelli Rhone Poulenc Morrisville, PA 215-295-7132
Eugene Distanto OHM
Jeff Bodi OHM
ED Makarewicz EPA
Paula Cammarata EPA

RP - Hexagon chemical purchased PCl_3 From RP and had white chemical convert. the PCl_3 For Hexagon Chem products
RP has shipped Phosphorus Anhydride To White Chemical (Also Phosphorus Pentoxide)
EPA (Paula) Informs RP of the Drums with RP Labels on Them.
Pivaloyle Chloride, CAbroyl Chloride was sold To RP From white chemical
RP States They ~~would~~ ship 3K gallons each Time.
Hexagon - mtN Lakes N.J.
RP states They shipped 3-4 Truckloads
RP Needs A letter From EPA Adressing The volunteer Efforts by RP

PCl_3 Class B Poison

Hexagon Industries Mt Arlington Lakes N.J.
MR Lee Smith, President. Enterprise
Chemical Intermediate supply co.

Jean Carver RP Tech service Person.

RP Pressurize tanks to Empty
Last Date of order From RP
Spring of 90.

Chipped Ice, soda Bicarb. For small spill cleanup.
Matlack transportation - dedicated transp. Company.

Mtg 12/13/90

NAME	ORGANIZATION	TELEPHONE #
Paula A Cammarata	EPA	201-621-9488 (site)
CLIFF MALAREK	RHONE POULENC BASIC	203-925-3449

0845 - 0935
1510 - 1620

Inventory
Provided to
Rhone-Poulenc

WHITE CHEMICAL
660 Frelinghuysen Ave.
Newark, NJ 07114

Inventory of Rhone Poulenc Drums
Date: 12/12/90

01 4-drums labeled Rhone Poulenc (RP), C8 F-C Capryloyl Chloride
Drums were blue poly in fair condition.

02 10 drums labeled RP, C8-Cl F/C, Capryloyl Chloride
Drums were blue green poly, 1 was in poor condition.

03 3 drums labeled C8 Cl, DISTN RES. These drums resembled the blue green poly, but were not specifically labeled RP.

04 1 drum labeled Piv Cl, Valoyl Cl.
The drum blue black and was not labeled RP, but resembled ones we had seen.

16 drums either Piv or C8 Cl. Drums were blue green, in fair condition. One was labeled Bocraft, but the others were not visibly labeled.

05 3 drums- 1 labeled RP Capryloyl Chloride, and 2 others not specifically labeled RP, but were C8 Dist Res and Cap Cl.

In the same area, there were about 20 drums along the wall of building 35, of Piv Cl that looked similar to RP drums, but were not labeled as such.

05A 18 drums of Piv Cl were against the boiler room wall. 12 drums were metal, the rest poly-not specifically labeled RP.

About 30 drums of Piv Cl were lined against the east wall of building 35, both metal and poly-not labeled RP.

06 7 drums- 2 stacked pallets with drums labeled C8 Cl Dist Resin. Only one was visibly labeled RP.

There were about 4 towards the egress gate by Cooper.

07 8 drums of Piv Cl, blue poly, not labeled RP.

12 metal drums of C8 Cl, not labeled RP

4 more PivCl drums, not designated RP

8 drums of C8Cl, 2 were visibly labeled RP.

8 metal drums C8Cl, 1 labeled RP, the others looking similar.
Drums were in poor condition.

4 metal drums of C8 Cl, not labeled RP. Metal drums in poor condition.

08 3 drums labeled RP. 2 possibly Propene, and the other approx. 6 pallets N, on the bottom of a stack of 3.

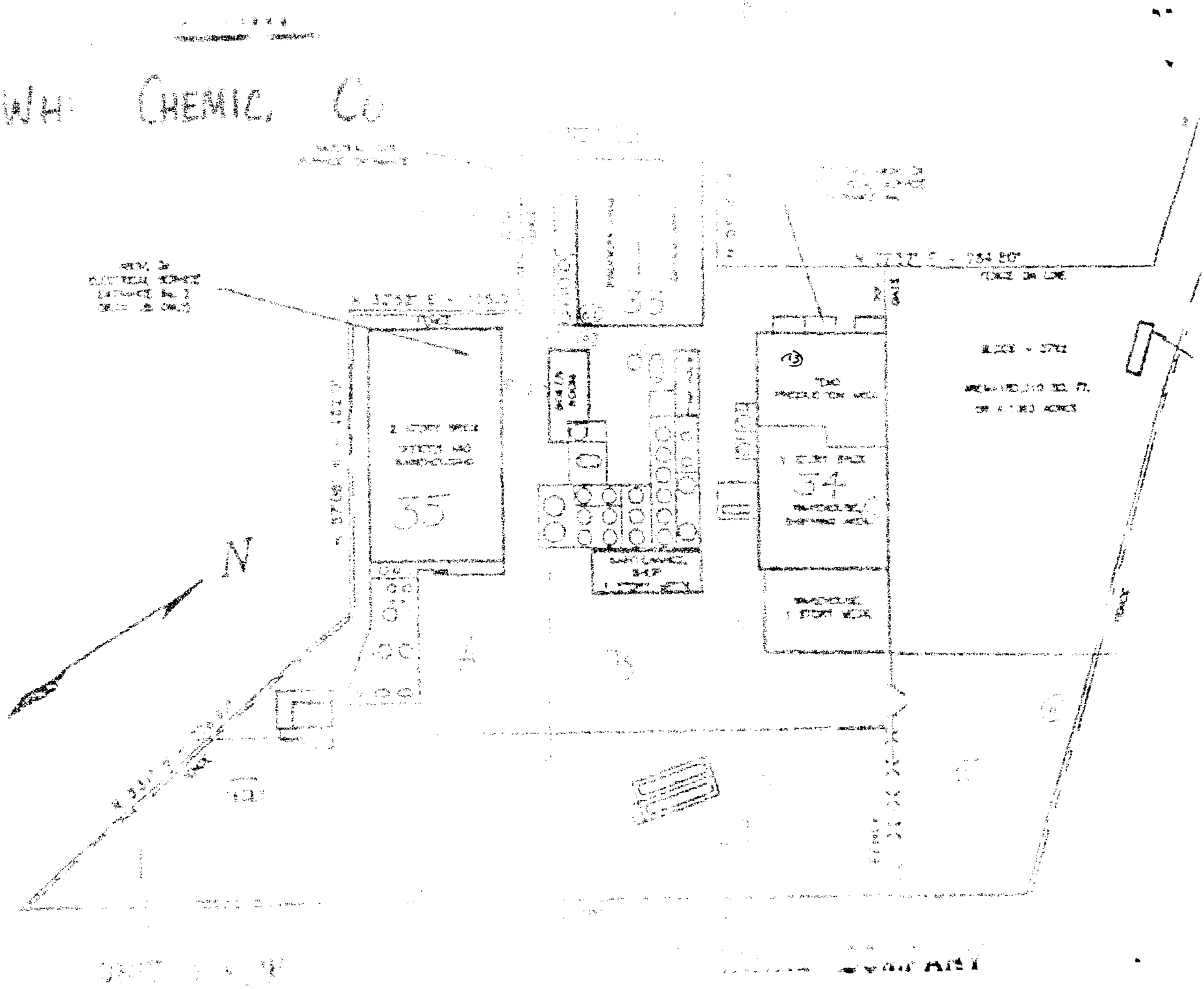
09 5 drums of blue/green poly drums of Cap Cl.

010 1 blue poly drum of Cap Cl, labeled RP.

011 1 metal drum of Cap Cl labeled RP

012 1 metal drum, 60 lb of Phosphoric Anhydride. Good condition- approx 2'x1.5'.

013 1 metal Drum, RP Painted Label, Contents Allyl Alcohol 55 gal


N
35
34

MANUFACTURERS LIST OF INVENTORY ITEMS

ITEM NUMBER	CHEMICAL NAME	LOCATION	SIZE OF CONTAINER		PERCENT VOLUME
**	Sherex				
10039	Unknown Liquid (Variquat K-1215)	ROOM 6/4I	32	oz	085

MANUFACTURERS LIST OF INVENTORY ITEMS

ITEM NUMBER	CHEMICAL NAME	LOCATION	SIZE OF CONTAINER	PERCENT VOLUME
** Sherex				
1262	Adol 62NF	ROOM 2/1B	1.0 qt	100
1365	Unknown Solid (Code #666-334)	ROOM 7/3E	1.0 qt	75
1490	Unknown Liquid (Variquat K4315)	ROOM 8/3A	1.0 qt	100

RECEIVED and FILED
Office of the Superior Court Clerk
by Deputy Clerk of the Superior Court
Patricia Mc Garry Drake

MAY 17 1991

Essex County

GABRIEL M. AMBROSIO, ESQ.
464 Valley Brook Avenue
P.O. Box 911
Lyndhurst, New Jersey 07071
(201) 933-8844
Attorneys for Plaintiff

PASSAIC VALLEY SEWERAGE COMMISSIONERS, a Public Body Corporate of the State of New Jersey,	:	SUPERIOR COURT OF NEW JERSEY CHANCERY DIVISION:ESSEX COUNTY
Plaintiff,	:	DOCKET NO. C-134-91
v.	:	CIVIL ACTION COMPLAINT
WHITE CHEMICAL CORPORATION,	:	
Defendant.	:	

Passaic Valley Sewerage Commissioners, a public body corporate of the State of New Jersey, complaining of Defendant, White Chemical Corporation, says that:

FIRST COUNT

1. Plaintiff, Passaic Valley Sewerage Commissioners (hereinafter PVSC) represents a public body corporate of the State of New Jersey organized pursuant to the laws of the State of New Jersey,

having its principal place of business at 600 Wilson Avenue, in the City of Newark, County of Essex and State of New Jersey.

2. Defendant, White Chemical Corporation (hereinafter known as White) is a corporation organized under the laws of the State of New Jersey with its principal place of business at 660 Frelinghuysen Avenue, in the City of Newark, County of Essex and State of New Jersey.

3. On or about July 25, 1988, PVSC issued a Sewer Connection Permit to Defendant, White. Pursuant to the terms and conditions of the aforesaid Sewer Connection Permit, Defendant, White, was to comply with discharge limitations, monitoring requirements and other conditions set forth therein. (See Exhibit A)

4. As part of the terms and conditions of the Sewer Permit, Defendant, White, was to have complied with effluent limitations and monitoring of said effluent.

5. In addition to the monitoring requirements set forth in the sewer connection permit issued to Defendant, White, was required to meet the following conditions:

a. Analysis of waste water parameters performed by a laboratory certified by the State of New Jersey.

b. Meet pre-treatment compliance standards as set forth in 40 CFR 414 CFR, 40 CFR 403.12 and any subsequent revisions thereto.

c. Submission of periodic compliance monitoring reports.

d. Submission of periodic user charge monitoring reports.

6. Pursuant to N.J.S.A. 58:14-1 et seq., Plaintiff, PVSC is empowered with the statutory authority to enforce its mandate, through the filing of law suits, against those entities who discharge sewage and/or other polluting matter directly or indirectly into the rivers and tributaries for which it is responsible.

7. Plaintiff, PVSC, pursuant to N.J.S.A. 58:14-1 et seq., is also empowered to adopt rules and regulations to enforce its statutory mandate.

8. Since on or about June 20, 1988, Defendant, White, has been in violation of N.J.S.A. 58:14-1 et seq. and PVSC Rules and Regulations. Defendant, White, continues to exceed limits for pH which PVSC is empowered to enforce as a publicly owned treatment works. Defendant, White's, levels for the aforesaid have been in excess of those permitted in its sewer connection permit granted to it by PVSC.

9. Plaintiff, PVSC as a direct and proximate result of Defendant, White's, action, has been caused to issue violations to Defendant, White, on or about June 20, 1988, July 5, 1988. August 29, 1988, February 1, 1989, March 28, 1989, May 11, 1989 and March 21, 1990, and any and all subsequent Notices of Violation thereafter.

10. Defendant, White, has been and/or continues to be in violation of PVSC Rules and Regulations, to wit:

a. Sections 312.12 (B) and 314.1 for discharge of corrosive waste causing damage to the sewer system and notification procedures to be used by Defendant, White, in the event its unable to comply with limitations set forth in PVSC rules and regulations and/or in its sewer connection permit, respectively.

11. Additionally, Defendant's, White, LEL control system and pH control system, and other pre-treatment systems, which it was required to install as part of PVSC's Rules and Regulations and/or part its Sewer Connection Permit, functioned and/or continues to function improperly. Furthermore, White fails to provide proper attention to the LEL and pH monitoring and control system resulting in the aforesaid violations, and therefore causing harm to the PVSC sewer system.

12. To date, Defendant, White, has failed to comply with PVSC's Rules and Regulations and N.J.S.A. 58:14-1 et seq. regarding the discharge directly or indirectly of pollution and/or to the rivers and tributaries, which PVSC has been empowered to regulate and control.

13. Despite numerous attempts by PVSC to remedy the aforesaid situation, and as documented by many Defendant, White, and PVSC's samples, Defendant, White, continues to be in violation of PVSC Rules and Regulations, N.J.S.A. 58:14-1 et seq. and/or in violation of its sewer connection permit with Plaintiff, PVSC.

14. Defendant, White, continues to operate in violation of N.J.S.A. 58:14-1 et seq. and/or PVSC rules and regulations.

WHEREFORE, Plaintiff, Passaic Valley Sewerage Commissioners, demands Judgment against Defendant, White, as follows:

a. For an Order revoking Defendant, White's, Sewer Permit;

b. Declaring Defendant to be in violation of N.J.S.A. 58:14-7 and PVSC Regulations;

c. Assessing fines and penalties for Defendant's, White, failure to be in compliance with N.J.S.A. 58:14-1 et seq. and/or PVSC Rules and Regulations;

d. For attorneys fees and costs;

e. For such other relief as the Court deems equitable and just.

GABRIEL M. AMBROSIO, ESQ.
Attorneys for Plaintiff

DATED: May 13, 1991

By: _____
Gabriel M. Ambrosio, Esq.
Chief Counsel

CERTIFICATION PURSUANT TO RULE 4:5-1

The Plaintiff hereby certifies that the matter in controversy is not the subject of any other action pending in any Court and is likewise not the subject of any pending arbitration proceeding. The Plaintiff further certifies that it has no knowledge of any contemplated action or arbitration proceeding which is contemplated regarding the subject matter of this action and that it is not aware of any other parties who should be joined in this action.

GABRIEL M. AMBROSIO, ESQ.
Attorneys for Plaintiff

DATED: May 13, 1991

By: _____
Gabriel M. Ambrosio, Esq.
Chief Counsel

PASSAIC VALLEY SEWERAGE COMMISSIONERS

SEWER CONNECTION PERMIT

PERMIT # 21404463

(Please use the Permit Number on any correspondence with PVSC)
In compliance with the provisions of the Federal Water Pollution Control Act, its amendments, the Clean Water Act and the Rules and Regulations of the Passaic Valley Sewerage Commissioners:

White Chemical Corporation

(herein, after referred to as the Permittee)

is authorized to discharge from a facility located at

660 Frelinghuysen Avenue

Newark, New Jersey 07114

to the Passaic Valley Sewerage Commissioners Treatment Works in accordance with discharge limitations, monitoring requirements and other conditions set forth herein.

EFFECTIVE DATE 07/25/88

EXPIRATION DATE 07/25/93

PASSAIC VALLEY SEWERAGE COMMISSIONERS

BY:

EXECUTIVE DIRECTOR

CONDITIONS

A. GENERAL PROHIBITIONS

1. No person shall discharge or deposit or cause or allow to be discharged or deposited into the treatment works or public sewer any waste which contains the following:

   a. **EXPLOSIVE MIXTURES**

   Pollutants which create a fire or explosion hazard to the treatment works, collection system or to the operation of the system. Prohibited materials include, but are not limited to, gasoline, kerosene, naphta, benzene, toluene, xylene, ethers, etc.

   b. **CORROSIVE WASTES**

   Any waste which will cause corrosion or deterioration of the treatment works. All wastes must have a pH not less than 5. Unless otherwise stated in the Sewer Connection Permit, all waste shall have a pH not more than 10.5 . Prohibited materials include, but are not limited to, acids, sulfides, concentrated chloride or flouride compounds, etc.

   c. **SOLID OR VISCOUS WASTES**

   Solid or viscous wastes which would cause obstruction to the flow in a sewer, or otherwise interfere with the proper operation of the treatment works. Prohibited materials include, but are not limited to, uncomminuted garbage, bones, hides or fleshings, cinders, sand, stove or marble dust, glass, etc.

   d. **OILS AND GREASE**

   (1) any industrial wastes containing floatable fats, wax, grease or oils.

   (2) any industrial wastes containing more than 100 mg/l of petroleum hydrocarbons.

   e. **NOXIOUS MATERIAL**

   Noxious or malodorous solids, liquids or gases, which, either singly or by interaction with other wastes, are capable of creating a public nuisance or hazard to life, or are or may be sufficient to prevent entry into a sewer for its maintenance and repair.

   f. **RADIOACTIVE WASTES**

   Radioactive wastes or isotopes of such half life or concentration that they do not comply with regulations or orders issued by the appropriate authority having control over their use and which will, or may cause damage or hazards to the treatment works or personnel operating the system.

g. **EXCESSIVE DISCHARGE RATE**

Industrial wastes discharged in a slug of such volume or strength so as to cause a treatment process upset and subsequent loss of treatment efficiency.

h. **HEAT**

(1) any discharge in excess of 150^0 F (65^0C)

(2) Heat in amounts which would inhibit biological activity in the PVSC treatment works resulting in a treatment process upset and subsequent loss of treatment efficiency, but in no case shall heat be introduced into the PVSC treatment works in such quantities that the temperature of the influent waters at the treatment plant exceed 40^0C (104^0F).

i. **UNPOLLUTED WATERS**

Any unpolluted water including, but not limited to, cooling water or uncontaminated storm water, which will increase the hydraulic load on the treatment system, except as approved by PVSC.

j. **WATER**

Any water added for the purpose of diluting wastes which would otherwise exceed applicable maximum concentration limits.

2. No person shall discharge or convey, or permit to be discharged or conveyed, to the treatment works any wastes containing pollutants of such character or quantity that will:

a. Not be susceptible to treatment or interfere with the process or efficiency of the treatment system.

b. Violate pretreatment standards. As pretreatment standards for toxic or other hazardous pollutants are promulgated by USEPA for a given industrial category, all industrial users within that category must immediately conform to the USEPA timetable as well as any numeric limitations imposed by USEPA. In addition, an industrial user shall comply with any more stringent standards as determined by PVSC or other agency.

c. Cause the PVSC treatment plant to violate its NJPDES permit, applicable receiving water standards, permit regulating sludge which is produced during treatment or any other permit issued to PVSC.

B. INSTALLATION OF SAMPLERS

The permittee shall install a 24 hour composite sampler on Outlets #1 & #2 acceptable to PVSC with attachments for affixing seals,

which shall be maintained in proper working order at all times. The installed samplers shall draw a sample, which shall be representative of plant waste, in accordance with the monitoring schedule contained in Section C **,**
Page(s) 5 & 6 **of** 17 **.**

Permittee shall insure that the sample is maintained between 1^0C-4^0C **during and after sample collection.**

C., **EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS**

1. During the period beginning (07/25/88) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) number(ed) (21404461-43200-0201). Such discharge shall be monitored by the permittee as specified below. Volume to be determined from water consumption data less 5% credit for evaporation. Outlet to have a separate water consumption meter. Building 34.

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	XXDAYXX AVERAGEX	DAILY MAX	MEASUREMENT FREQUENCY	SAMPLE TYPE	REPORTING PERIOD
BOD (0310)	XXXXXXX	XXXXXX	Quarterly	24 hr. comp.	Quarterly
TSS (0530)	XXXXXXX	XXXXXX	Quarterly	24 hr. comp.	Quarterly
pH (9000)	XXXXXXX	5 to 10.5	Continuous	Recorder	*
LEL	XXXXXXX	40%	Continuous	Recorder	*
Polybrominated biphenyls	XXXXXXX	XXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Deca Bromobiphenyl Oxide	XXXXXXX	XXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Chlorinated Organics	XXXXXXX	XXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Volume	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	Quarterly

* Permittee to store pH and LEL Recorder Charts and have available for review by PVSC personnel on demand.

Rev: 6/90

C. EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS

1. During the period beginning (07/25/88) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) number(ed) (21404462-43200-0201). Such discharge shall be monitored by the permittee as specified below. Volume to be determined from water consumption data less 5 % credit for evaporation. Building 33.

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	XXDAYXX AVERAGEXX	DAILY MAX	MEASUREMENT FREQUENCY	SAMPLE TYPE	REPORTING PERIOD
BOD (0310)	XXXXXXX	XXXXXXX	Quarterly	24 hr. comp.	Quarterly
TSS (0530)	XXXXXXX	XXXXXXX	Quarterly	24 hr. comp.	Quarterly
pH (9000)	XXXXXXX	5 to 10.5	Continuous	Recorder	*
Polybrominated biphenyls	XXXXXXX	XXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Deca Bromobiphenyl Oxide	XXXXXXX	XXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Chlorinated Organics	XXXXXXX	XXXXXXX	Twice/Quarterly	24 hr. comp.	Quarterly
Volume	XXXXXXX	XXXXXXX	XXXXXX	XXXXXX	Quarterly

* Permittee to store pH Recorder Charts and have available for review by PVSC personnel on demand.

Rev: 6/90

C. , **EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS**

1. During the period beginning (07/25/88) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) number(ed) (21404463-43200-0201). Such discharge shall be monitored by the permittee as specified below. Volume to be determined from water consumption data. Domestic waste only to be discharged from this outlet. Outlet to have separate water meters. Buildings 33 and 35.

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	XDAYXX AVERAGEX	XDAILY MAXX	MEASUREMENT FREQUENCY	SAMPLE TYPE	REPORTING PERIOD
BOD (0310)	XXXXXX	XXXXXX	N/A *	N/A *	XXXXX
TSS (0530)	XXXXXX	XXXXXX	N/A *	N/A *	XXXXX
Volume	XXXXXX	XXXXXX	XXXXXX	XXXXXX	Quarterly

* Concentration for User Charge to be determined from Residential Strength Standards.

Rev: 6/90

C. EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS

1. During the period beginning (11/05/90) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) numbered (21404461-43200-0201). Such discharge shall be monitored by the permittee as specified below. Building 34. Volume to be determined from water consumption data less 5% credit for evaporation. Outlet to have a separate water consumption meter. Permittee to submit volume in accordance with PVSC Pretreatment Monitoring Report Form MR-1.

40 CFR 414.75, Subpart G

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	All units are in Micrograms per liter		Measurement Frequency	Sample Type	Reporting Period
	DAILY MAX.	MONTHLY AVG.			
VOLUME	XXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXXXXX	XXXXXXXXXXXX	Semi-Annually
(a)	(a)	(a)	Twice/Year	(a)	Semi-Annually

(a) See Page 11 of 17, Section 2D of this Permit for Effluent Characteristics, Daily and Monthly Discharge Limitations, and Sample Type.

C. EFFLUENT LIMITATIONS, MONITORING AND COMPLIANCE REQUIREMENTS

1. During the period beginning (11/05/90) and lasting through (07/25/93) the permittee is authorized to discharge from outlet(s) numbered (21404462-43200-0201). Such discharge shall be monitored by the permittee as specified below. Building 33. Volume to be determined from water consumption data less 5% credit for evaporation. Permittee to submit volume in accordance with PVSC Pretreatment Monitoring Report Form MR-1.

40 CFR 414.75, Subpart G

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	All units are in Micrograms per liter		Measurement Frequency	Sample Type	Reporting Period
	DAILY MAX.	MONTHLY AVG.			
VOLUME	XXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXXXXX	XXXXXXXXXXXX	Semi-Annually
(a)	(a)	(a)	Twice/Year	(a)	Semi-Annually

(a) See Page 11 of 17, Section 2D of this Permit for Effluent Characteristics, Daily and Monthly Discharge Limitations, and Sample Type.

21404463 White Chemical Corp.

2. In addition to the monitoring required in Section C.1. the Permittee is required to meet the following schedule of compliance:

   A. Analysis of wastewater parameters shall be performed by a laboratory that has been certified by the State of New Jersey.

   B. Installation of water meter:

      09/06/88 Water meter to be installed on domestic discharge in building 33.

   C. Pretreatment Compliance Requirements - Organic Chemicals Categorical Pretreatment Standards 40 CFR 414.

      11/05/90 Permittee to be in compliance with Organic Chemicals Categorical Pretreatment Standards 40 CFR 414.75 Subpart G.

      02/05/91 Permittee to submit a Compliance Report to PVSC demonstrating compliance with Organic Chemicals Pretreatment Standards. The report shall be in accordance with General Pretreatment Regulations 40 CFR 403.12 section (d).

      7/21/91 First Periodic Compliance Monitoring Report due. Permittee to submit Periodic Compliance Monitoring Report Semi-Annually January 21 and July 21 in accordance with General Pretreatment Regulations 40 CFR 403.12 section (e).

ADDITIONAL REQUIREMENTS SECTION C CONTINUED:

D.

Effluent Characteristics	Maximum for any one day	Maximum for monthly average	Sample Type
Benzene	134	57	Grab
Carbon Tetrachloride	380	142	Grab
Chlorobenzene	380	142	Grab
1,2,4-Trichlorobenzene	794	196	Composite
Hexachlorobenzene	794	196	Composite
1,2-Dichloroethane	574	180	Grab
1,1,1-Trichloroethane	59	22	Grab
Hexachloroethane	794	196	Composite
1,1-Dichloroethane	59	22	Grab
1,1,2-Trichloroethane	127	32	Grab
Chloroethane	295	110	Grab
Chloroform	325	111	Grab
1,2-Dichlorobenzene	794	196	Composite
1,3-Dichlorobenzene	380	142	Composite
1,4-Dichlorobenzene	380	142	Composite
1,1-Dichloroethylene	60	22	Grab
1,2-Trans-Dichloroethylene	66	25	Grab
1,2-Dichloropropane	794	196	Grab
1,3-Dichloropropylene	794	196	Grab
Ethylbenzene	380	142	Grab
Methylene Chloride	170	36	Grab
Methyl Chloride	295	110	Grab
Hexachlorobutadiene	380	142	Composite
Nitrobenzene	6402	2237	Composite
2-Nitrophenol	231	65	Composite
4-Nitrophenol	576	162	Composite
4,6-Dinitro-O-Cresol	277	78	Composite
Tetrachloroethylene	164	52	Grab
Toluene	74	28	Grab
Trichloroethylene	69	26	Grab
Vinyl Chloride	172	97	Grab
Total Cyanide	1200	420	Grab
Total Lead	690	320	Composite
Total Zinc	2610	1050	Composite

D. MONITORING AND REPORTING

1. USER CHARGE

Monitoring results obtained during the previous 3 months shall be reported on Discharge Monitoring Report Form MR-2. Reports are due January 21, April 21, July 21, October 21. The first report is due on (*). If an Industrial user fails to submit Form MR-2 on a timely basis, the Executive Director shall estimate the use for the period. The estimates may be made 30 days after the due date of the report, except for the fourth quarter where the estimates may be made after October 21.

2. PRETREATMENT

Monitoring results shall be reported on Discharge Monitoring Report Form, MR-1 Semi-Annually. Reports are due January 21 and July 21.

3. REPORTS

Properly signed reports required herein shall be submitted to PVSC at the following address:

PASSAIC VALLEY SEWERAGE COMMISSIONERS
INDUSTRIAL WASTE CONTROL DEPARTMENT
600 Wilson Avenue
Newark, NJ 07105

4. TEST PROCEDURES

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. Test procedures for the analysis of pollutants shall conform to regulations contained in the PVSC Rules and Regulations, Federal, State and local laws or regulations.

5. RECORDING OF RESULTS

For each measurement of a sample taken pursuant to the requirements of this permit, the permittee shall maintain a record of the following information:

a. The date, exact place and time of sampling;
b. The dates the analyses were performed;
c. The person (s) who performed the analysis;
d. The analytical techniques or methods used;
e. The results of all required analyses.

* Permittee has been required to submit Monitoring Reports MR-2 to PVSC since 10/15/83.

6. **ADDITIONAL MONITORING BY PERMITTEE**

If the permittee monitors any pollutant at the location (s) designated herein more frequently than required by this permit, using the approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Forms (PVSC Form MR-1 or MR-2). Such increased frequency shall also be indicated.

7. **RECORDS RETENTION**

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed, calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of (5) years.

8. **DEFINITIONS**

a. The "30 day average" discharge means the average of daily values for 30 consecutive monitoring days. For the purpose of enforcement of Pretreatment Standards, consecutive samples taken and analyzed shall be considered as being taken on consecutive days even though one or more non-sampling days intervene. In applying the Pretreatment Standards where more than one but less than 30 samples have been taken and analyzed during any month, a formula, specified by USEPA, will be used to calculate the "30 day average".

b. The "daily maximum" discharge means the highest discharge by weight or other appropriate units, as specified herein, during any calendar day.

c. "Daily" - each operating day.

d. "Weekly" - one day each week during a normal operating day.

e. "Monthly" - one day each month during a normal operating day.

f. "Composite" - a combination of individual samples obtained at regular intervals over the entire discharge day.

The volume of each sample shall be proportional to the discharge flow rate unless specifically modified by PVSC. For a 24 hour continuous discharge, a minimum of 24 individual samples shall be collected at equal intervals and at least once per hour. For continuous discharges of less than 12 hours, individual samples shall be taken at least once every 30 minutes. For discharges which are not continuous, individual samples shall be taken such that they will be representative of plant waste.

g. "Grab" - an individual sample collected in less than 15 minutes
h. "Quarterly" - every three (3) months.
i. "N/A" - not applicable.

E. MANAGEMENT REQUIREMENTS

1. CHANGE IN DISCHARGES

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or modification which will result in new, different, or increased discharges of pollutants must be reported by submission of a new PVSC Sewer Connection Application or, if such changes will not violate the effluent limitations specified in this permit, by notices to PVSC of such changes. Following such notices, the permit may be modified to specify and limit any pollutants not previously limited.

2. NONCONPLIANCE NOTIFICATION

If, for any reason, the permittee does not comply with, or will be unable to comply with any effluent limitation specified in this permit, the permittee shall notify PVSC within 24 hours of the occurrence.

If this report is made orally, a written report containing the following information, shall be submitted within five (5) working days:

a. A description of the discharge and the cause of the period of noncompliance;

b. The period of noncompliance, including exact dates and times, or, if not corrected, the anticipated time the noncompliance is expected to continue, and

c. The steps being taken to reduce, eliminate and prevent a recurrence of the noncomplying discharge.

3. **FACILITIES OPERATION**

The permittee shall at all times maintain in good working order and operate as efficiently as possible all pretreatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. **ADVERSE IMPACT**

The permittee shall take all reasonable steps to minimize any adverse impact to the PVSC Treatment Works resulting from noncompliance with any pretreatment limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge. This condition in no way affects PVSC's right to suspend a permit in order to stop a discharge which presents an imminent or substantial hazard to the public health, safety or welfare to the local environment or which interferes with the operation of the PVSC Treatment Works.

5. **REMOVED SUBSTANCES**

Solids, sludges, filter backwash or other pollutants or hazardous waste removed in the course of pretreatment or control of wastewaters and/or the treatment of intake waters shall be disposed of in accordance with applicable Federal, State and local laws and regulations. Records documenting such disposal shall be made available to PVSC for review upon request.

F. MANAGEMENT RESPONSIBILITIES

1. RIGHT OF ENTRY

The permittee shall allow the authorized representatives of PVSC, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring methods required in this permit; and to sample any discharge of pollutants.

2. TRANSFER OF OWNERSHIP OR CONTROL

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall, in writing, notify the succeeding owner or controller of the existence of this permit, and the need to apply for a new permit, a copy of which shall be forwarded to PVSC.

3. PERMIT MODIFICATION

After notice and opportunity for a hearing, this permit may be modified, or revoked in whole or in part during its terms for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

4. **TOXIC POLLUTANTS**

Notwithstanding (Section C), above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition), is established under Section 307 (b) of the Federal Water Pollution Control Act (the Act), its amendments, or any other subsequent law or regulation, for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

5. **CIVIL AND CRIMINAL LIABILITY**

Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

6. **STATE LAWS**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State Law or regulation under authority preserved by Section 510, of the Federal Water Pollution Control Act. (The Act)

7. **PROPERTY RIGHTS**

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

8. **SEVERABILITY**

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances , is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

MAY 1991
GABRIEL M. AMBROSIO, ESQ.

FOR USE BY CLERK'S OFFICE ONLY

PAYMENT TYPE:	CK	CG	CA
CHG / CK NO.			
AMOUNT:			
OVERPAYMENT:			

CIVIL CASE INFORMATION STATEMENT (CIS) Use for initial pleadings (not motions) under R. 4:5-1.

ATTORNEY NAME	TELEPHONE NUMBER	COUNTY OF VENUE
GABRIEL M. AMBROSIO, ESQ.	(201) 933-8844	ESSEX
FIRM NAME (If Applicable)		DOCKET NUMBER (When Available)
OFFICE ADDRESS 464 Valley Brook Avenue Lyndhurst, NJ 07071		DOCUMENT TYPE (See reverse side for listing): Complaint JURY DEMAND: ☐ Yes ☒ No
NAME OF PARTY (e.g., John Doe, Plaintiff)	CAPTION	
PASSAIC VALLEY SEWERAGE COMMISSIONERS VS. WHITE CHEMICAL CORPORATION		

THE INFORMATION PROVIDED BELOW CANNOT BE INTRODUCED INTO EVIDENCE

CASE TYPE NUMBER (See reverse side for listing): 156 | Is this a Title 59 action? ☐ Yes ☒ No

Check if applicable: ☐ Punitive Damages ☐ Friendly Hearing Sought ☐ Declaratory Judgment

CDR Desired? ☐ Yes Specify type: ☐ No

Present Medical Expenses:

☐ $2500 or less ☐ More than $2500, If more, do you wish to submit this case to Arbitration? ☐ Yes ☐ No

Briefly describe the case; include any special characteristics that may warrant extended discovery or accelerated disposition (See reverse side for additional instructions):

Violation of sewer connection permit.

Describe all pending actions related to this case, i.e., arising out of the same occurrence or transaction (give docket number if known):

ESTIMATED NUMBER OF DAYS TO TRY THE CASE	CASE ASSESSMENT (Mandatory for DCM Counties)
Liability: 3-5 days Damages: 1 day	☐ Expedited ☒ Standard ☐ Complex

WHITE CHEMICAL SITE
INVENTORY OF DRUM CONTAINERS
(data extracted from ERCS Drum Logs)

16 October 1991

0601-0999	complete
1000-1499	complete
1500-1899	complete
1900-2399	complete
2400-2899	complete
2900-3399	complete
3400-3899	complete
3900-4399	complete
4400-4899	complete
4900-5399	complete
5400-5899	complete
5900-6399	complete
6400-6899	complete
6900-7399	complete
7400-7899	complete

Sorted by chemical label data

7113	1-Pentanol (Aldrich Chemical Co.)
6897	2,4,6, Tribromophenyl Acetate
7501	2 gallon gas can
7502	2 gallon gas can
6796	2-Hydroxy Ethyl Methacrylate (Made in Japan)
6602	5-Bromo Phenyl Allyl Ether
4376	acetal chloride
6803	Acetic Acid
5771	Acetic acid
7241	Acetone
4382	acetone
4425	acetone (Sargent-Welsh)
7171	Acetone (Seedles Chemical)
5659	acetyl chloride
4438	Acetyl Chloride
1673	acetyl chloride
2893	acetyl chloride
5815	Acetyl Chloride
6881	Acetyl Chloride
6618	Actipic Acid
7223	AEROTEX H2O Repelent 96 (American Cynamed)

7133 Aerotex resins M-3
4269 allyl bromide
4264 allyl bromide
4262 allyl bromide
4263 allyl bromide
4270 allyl bromide
4271 allyl bromide
4261 allyl bromide
4272 allyl bromide
4268 allyl bromide
4260 allyl bromide
4268 allyl bromide
7154 Alumina Trihydrate
7161 Alumina Trihydrate Al(OH)3 (Huber Corp)
6985 Ammonium Polyphosphate CAS# 68333-79-9 (Monsanto)
7458 Amphorus Red Phosphorus
7750 Anhydrous Caustic Soda Beads
7071 Anti Slick (handwritten)
7308 Antimony Trioxide
7233 Avitex Surfactant (Dupont)
7173 BCI Dichloromethane (Bio Chemicals Lab)
6653 BC-25
6518 BiPhenylOxide
6654 BN-451
7267 Boric Acid
6259 Boron Phosphate
6939 Bromide (handwritten)
6260 Brominated Fire Retardant (White Chemical)
6261 Brominated Fire Retardant (White Chemical)
6478 Brominated Flame Retardent
6477 Brominated Flame Retardent
6937 Brominated Flame Retardent (White Chemical)
7822 Bromine
6802 Bromine D` Allyl (FRENCH) C3H5Br
7151 Butylated Tri Phenol Phosphate (Phosflex 71-B Flame Retardant)
3283 C4 phosphoric acid/EDC/HCl
4954 C4Cl
7499 C6Br
7498 C6Br
6290 Caliban
7508 Caliban
7528 Caliban
6379 Caliban
6140 Caliban
6271 Caliban
6153 Caliban

6726 Caliban P-44
7169 Caliban (Decabromodiphenyl Oxide) WHITE CHEMICAL
7168 Caliban (Decabromodiphenyl Oxide) WHITE CHEMICAL
7307 Caliban (WHITE CHEMICAL)
7323 Caliban (WHITE CHEMICAL)
7317 Caliban (WHITE CHEMICAL)
7332 Caliban (WHITE CHEMICAL)
7315 Caliban (WHITE CHEMICAL)
7328 Caliban (WHITE CHEMICAL)
7368 Caliban (WHITE CHEMICAL)
7333 Caliban (WHITE CHEMICAL)
7199 Caliban (WHITE CHEMICAL)
3471 capryloyl chloride
3451 capryloyl chloride
3446 capryloyl chloride
6072 Capryloyl Chloride
6076 Capryloyl Chloride
7295 Capryloyl Cl
7155 Carbon Slurry
7757 Caustic Soda Beads
6468 Cellosize Hydroxyethyl Cellosolve (Union Carbide)
7065 CH2 Cl2 Dichloromethane (Albrich Chemical Co.)
7112 Chlorine (illegable handwriting)
5629 chromic acetate
3284 chromic acetate
4991 Cl material
7242 Coconut Fatty Acid
7160 Colliodial Antimony Pentoxide (Nyacol Chemical Co.)
7268 Colloidal Antimony Pentoxide
5764 Corrosive Liquid UN-1760
6699 Corrosive Liq. NOS
7245 CST Anti Stick
6217 Cyanurate Acid Anhydrate
6330 Cyanuric, Ground
6331 Cyanuric, Ground
6322 Cyanuric, Ground
6329 Cyanuric, Ground
6320 Cyanuric, Ground
6332 Cyanuric, Ground
6318 Cyanuric Acid
6319 Cyanuric Acid
6201 Cyanuric Acid Hydrate (Olin Corp)
6135 Cyanuric (ground)
6474 DBDPO
6552 DBDPO
6460 DBDPO

7139 Ethyl Alcohol, Denatured 180 proof
5571 ethylene chloride
7262 Ethylene Vinyl Chloride Copolymer (Air Flex) Sgall — pH
7118 Fabric Protector
3424 fatty acid
7523 Feedwater Oxygen Scavanger
6380 Fire Brake – 2B
6630 Flame Retardant
6252 Flame Retardant Cloth 80%
7188 Flame Retardant (WHITE CHEMICAL)
7257 Formaldehyde in Urea solution
5973 Glacial Acetic
6038 Glacial Acrylic Acid
7191 HBC
6417 HBCD
7200 HBCDD
6515 HBCDD
5804 HBr
3344 HBr
4952 HBr
5762 HBr
5102 HBr 48%
3345 HBr/EDC
3346 HBr/EDC
2223 HCL
3285 HCl
2702 HCL stripped
7852 Heptanoyl Cl
6501 Hexa Bromo Benzene
6500 Hexa Bromo Benzene
6514 Hexa Cylco Do Decane No H2O (handwritten)
7149 Hexabromo Benzene
6519 HexaBromoBenzene
7009 Hexabromocyclododecane
7239 Hexane (ACS Reagent)
6986 Hexybromocyclodocane
7491 Hexyl Br
7500 Hexyl Br
7484 Hexyl Br
7493 Hexyl Br
7790 Hexyl Br
7483 Hexyl Br
7492 Hexyl Br
7497 Hexyl Br
6263 Hydriodic Acid
6822 HydroBromic Acid

6823 HydroBromic Acid
6764 Hydrobromic Acid
2974 hydrobromic acid
6801 Hypophosphoric Acid
6720 Hypophosphoric Acid
6711 Hypophosphoric Acid
7172 Iroc Powder
6938 Iso butyl bromide
6291 Iso Cyanuric Acid (98.5%)
6133 Iso Cyanuric Acid (98.5%)
6146 Iso Cyanuric Acid (98.5%)
2265 Iso Cyanuric Acid (98.5%)
6316 Iso Cyanuric Acid (98.5%)
6147 Iso Cyanuric Acid (98.5%)
6158 Iso Cyanuric Acid (98.5%)
5168 Iso Cyanuric Acid (98.5%)
6159 Iso Cyanuric Acid (98.5%)
7238 Iso Nohanoic
7214 Isocyanate TDI (Niax)
6942 Isocyanuric acid
6744 Isopropanol
6742 Isopropanol
6745 Isopropanol
7105 Johnson Wax (Traffic Grade)
7109 KEW-REACT (KENVICH PETROCHEMICALS INC. BAYONNNE NJ.)
6615 Lauric Pyridinium Br
7287 Lauroyl Cl
7296 Lauroyl Cl
7292 Lauroyl Cl
7293 Lauroyl Cl
7282 Lauroyl Cl
7294 Lauroyl Cl
7291 Lauroyl Cl
7303 Lauroyl Cl
7300 Lauroyl Cl
7283 Lauroyl Cl
7275 Lauroyl Cl
7302 Lauroyl Cl
7286 Lauroyl Cl
7299 Lauroyl Cl
7272 Lauroyl Cl
7277 Lauroyl Cl
7276 Lauroyl Cl
7290 Lauroyl Cl
7273 Lauroyl Cl
7274 Lauroyl Cl

7297 Lauroyl Cl
7280 Lauroyl Cl
7301 Lauroyl Cl
7291 Lauroyl Cl
7289 Lauroyl Cl
7285 Lauroyl Cl
7298 Lauroyl Cl
7136 Linseed Oil
7691 Liq Phos
7692 Liq Phos
7781 Liq Phos Acid
7802 Liq Phos Acid
7744 Liq Phos Acid
7752 Liq Phos Acid
7802 Liq Phos Acid
7574 Liquid Phos Acid
7097 Lot 66
6464 Magnesium Chloride (Dow Chemical)
7096 Melamine Petrosulfate (American Cynamide)
6272 Melimine Flame Retardant (ODD)
6209 MCA
6221 MCA
6384 MCA-65
6277 MCA-66
7265 Melamine
6176 Melamine
6339 Melamine Borate
7050 Melamine Cyanurate (Satex 102)
6282 Melamine Cyanurate
7060 Melamine Cyanurate
6292 Melamine Cyanurate
7046 Melamine Cyanurate
7054 Melamine Cyanurate
6245 Melamine Cyanurate
6178 Melamine Cyanurate
6240 Melamine Cyanurate
6313 Melamine Cyanurate
7047 Melamine Cyanurate
6317 Melamine Cyanurate
6193 Melamine Cyanurate
6230 Melamine Cyanurate
6194 Melamine Cyanurate
6191 Melamine Cyanurate
6195 Melamine Cyanurate
6192 Melamine Cyanurate
6312 Melamine Cyanurate

6188 Melamine Cyanurate
6311 Melamine Cyanurate
7051 Melamine Cyanurate
7039 Melamine Cyanurate
6251 Melamine Cyanurate
6203 Melamine Cyanurate
6257 Melamine Cyanurate
6208 Melamine Cyanurate
7044 Melamine Cyanurate
6211 Melamine Cyanurate
7040 Melamine Cyanurate
6218 Melamine Cyanurate
7052 Melamine Cyanurate
6220 Melamine Cyanurate
6280 Melamine Cyanurate
7061 Melamine Cyanurate
7056 Melamine Cyanurate
7048 Melamine Cyanurate
7055 Melamine Cyanurate
7058 Melamine Cyanurate
6302 Melamine Cyanurate
7517 Melamine Cyanurate
6303 Melamine Cyanurate
6199 Melamine Cyanurate
6304 Melamine Cyanurate
6207 Melamine Cyanurate
7043 Melamine Cyanurate
6310 Melamine Cyanurate
6305 Melamine Cyanurate
7053 Melamine Cyanurate
6306 Melamine Cyanurate
6308 Melamine Cyanurate
7042 Melamine Cyanurate
6197 Melamine Cyanurate
6307 Melamine Cyanurate
6210 Melamine Cyanurate
6315 Melamine Cyanurate
7049 Melamine Cyanurate
6314 Melamine Cyanurate
6202 Melamine Cyanurate
6195 Melamine Cyanurate
6219 Melamine Cyanurate
7041 Melamine Cyanurate
6173 Melamine Ortho Phosphate
6200 Melamine Ortho Phosphate
6198 Melamine Ortho Phosphate

6434 DBDPO
6457 DBDPO
7159 DBPO
7057 Deca Bromo Di Phenyl Oxide
7059 Deca Bromo Di Phenyl Oxide
6487 Deca Bromo Di Phenyl Oxide (Handwritten)
6819 DecaBrom Diphenyl.....?
6507 DecaBromoBiPhenylOxide
6616 DecaBromoBiPhenylOxide
6899 DecaBromoDiphenyl Oxide
6455 Decabromodiphenyl oxide
6268 DeChlorane 404
7485 Decyl
7135 Detergent
6166 DHE-COQ
6167 DHE-COQ
6258 DHF 200
6267 DHF 400
6228 DHF 400
6287 Di Melamine Phosphate
6243 Di Melamine Phosphate
6227 Di Melamine Phosphate
6226 Di Melamine Phosphate
6244 Di Melamine Phosphate
6273 Di Melamine Phosphate
6300 Di Melamine Phosphate
7115 Dichlormethane (Mallinckroft).
7236 DiChloroEthane
7254 Dichloromethane
2987 diethyl oxalate
6709 Diphenyl Oxide
6516 DOX wash
6517 DOX wash
7219 DPX Chlorinated
7349 Dry Spersion
7530 Dry Spersion
7058 DSPN (handwritten)
2359 EDC
2361 EDC
2363 EDC
2360 EDC
2362 EDC
3516 EDC dist/bottoms
3515 EDC dist/bottoms
3250 EDC/Bromine
7237 Ethyl Acetate

6162 Melamine Ortho Phosphate
6309 Melamine Ortho Phosphate
6163 Melamine Ortho Phosphate
7509 Melamine Phosphate
6248 Melamine Pyro Phosphate
7305 Melamine Pyro Phosphate
7106 Melamine Pyrophosphate (Cynamid)
7063 MEOH (handwritten) White Chemical
4311 MEOH/H2O
6382 Meta bi Sulfate
6808 Metayiene (spelling ? {Metaxylene ?})
6761 Methanol, Anhydrous
7126 Methyl Alchol
7170 Met[illegible]l Alcohol Anhydrous (Mallencroft)
1834 methyl benzyl chloride
6748 Methyl Benzyl Chloride
7311 Methyl Parasept
7316 Methyl Parasept (Kalama Chemical)
4211 methylene chloride
7177 Mother of Pearl irredescent
7288 Myristol Bromide
2988 Mystryl Bromide
6791 Na2CO3 Soda Ash
2402 NaOH flake
7849 NeoDecanoic Acid
7850 NeoDecanoic Acid
7848 NeoDecanoic Acid
4281 neo-decanoic acid
7085 NH4OH
3329 Nitrillo Trimethylene/ Triphosphoric acid
2823 n-butyric acid
2440 n-methyl benzyl chloride
5563 n-pentanol
7240 n-propyl alcohol
6286 OBOB
6142 OBOB
6145 OBOB
6144 OBOB
6157 OBOB
6156 OBOB
6284 OBOB
6234 OBOB
6326 OBOB
6336 OBOB
6155 OBOB
6296 OBOB

6283 OBOB
6154 OBOB
6299 OBOB
6335 OBOB
6239 OBOB
6285 OBOB
6254 OBOB
6297 OBOB
6325 OBOB
6249 OBOB
6143 OBOB
6922 Octabromo Diphenyl Oxide
7216 Organic Phosphate Ester
7231 Ovenolate 98
6954 Palmitoyl Bromide
6804 Para Xylene
2592 para-xylene
2222 para-xylene
7534 PBr3
6868 PBr3
7539 PBr3
7535 PBr3
6857 PBr3
7538 PBr3
7536 PBr3
7537 PBr3
7791 PCl3 (transfered 5/2/91)
7120 Pentone
5760 Phenol
7078 Phenyl Acetic Acid, pure FCC (Givaudan Corp. Clifton, NJ.)
6553 Phenyl Benzoate
7514 Phenyl Benzoate
6569 Phenyl Benzoate
7542 Phos Acid
7840 Phos Acid
3597 phos acid
7692 Phos Acid
7838 Phos Acid
5088 phos (liquid)
5817 PHOSFLEX 71B
3286 phosphoric acid
2912 phosphoric acid
2807 phosphoric acid
3315 phosphoric acid
5803 Phosphoric Acid
2845 phosphoric acid (liquid)

4447 Phosphoric acid (liquid)
2401 phosphoric acid (liquid)
2400 phosphoric acid (liquid)
5775 Phosphoric Liquid
5800 phosphoric liquid
6925 Phosphorous Tribromide
6924 Phosphorous Tribromide
6695 Phos. Acid
6704 Phos. Acid 85%
6705 Phos. Acid 85% (Kramer Chemicals)
5861 Piv Cl
3666 pivaloyl chloride
3323 pivaloyl chloride
3323 pivaloyl chloride
2443 pivaloyl chloride
7123 Pluracol Polyol
6276 Polypropylene
6835 Potassium Chloride
7494 PRBR
7495 PRBR
7582 Propanoic Acid
5745 propionic acid
6127 Propionic Acid
6747 Propionic Acid
5508 propionic acid
7495 Propyl Bromide
6073 PVCl
6843 Pyridene
6852 Pyridine
6851 Pyridine
6337 Pyro, dry
6338 Pyro, lump
6227 PYROCHECK
6214 PYROCHECK
6236 PYROCHECK
6215 PYROCHECK
6253 PYROCHECK
6327 PYROCHECK
6180 PyroCheck (Floor Sweepings)
6250 PYROSET (flame retardant) American Cynamid
6190 PYROSET (flame retardant) American Cynamid
6740 Pyrovatex
6715 Pyrovatex
2784 p-methyl benzyl chloride
5628 p-xylene
6951 Red Phosphorous (United Phosphorous-Vapi, India)

7450 Red Phosphorous (United Phosphorus - Vapi, India)
6465 Rhoplex
6241 SAYTEX (DecaBromoDiPhenyl Oxide)
6321 SAYTEX (DecaBromoDiPhenyl Oxide)
7373 SAYTEX (DecaBromoDiPhenyl Oxide)
6293 SAYTEX (DecaBromoDiPhenyl Oxide)
6225 SAYTEX (DecaBromoDiPhenyl Oxide)
6224 SAYTEX (DecaBromoDiPhenyl Oxide)
6169 SAYTEX (DecaBromoDiPhenyl Oxide)
6265 SAYTEX (HexaBromoCycloDoDecane)
6264 SAYTEX (HexaBromoCycloDoDecane)
6269 Selite
6793 SMA Resins - Ammonium SaH/ Styrene Maleic Anhydride Copolymer
7107 Soda Ash
7085 Soda Ash
7110 Sodium Bicarbonate
7139 Sodium BiCarbonate
6568 Sodium Bisulfate
4062 sodium bisulfite
1272 sodium chlorate
7885 Sodium Chlorate
7859 Sodium Chlorate
7884 Sodium Chlorate
7906 Sodium Chlorate
7858 Sodium Chlorate
7882 Sodium Chlorate
7904 Sodium Chlorate
7881 Sodium Chlorate
7903 Sodium Chlorate
7880 Sodium Chlorate
7901 Sodium Chlorate
7900 Sodium Chlorate
7862 Sodium Chlorate
1271 sodium chlorate
7898 Sodium Chlorate
7899 Sodium Chlorate
7897 Sodium Chlorate
7895 Sodium Chlorate
7896 Sodium Chlorate
7894 Sodium Chlorate
7868 Sodium Chlorate
7893 Sodium Chlorate
7891 Sodium Chlorate
7879 Sodium Chlorate
7890 Sodium Chlorate
7878 Sodium Chlorate

7889 Sodium Chlorate
7877 Sodium Chlorate
7887 Sodium Chlorate
7876 Sodium Chlorate
7851 Sodium Chlorate
7875 Sodium Chlorate
7905 Sodium Chlorate
7874 Sodium Chlorate
7902 Sodium Chlorate
7873 Sodium Chlorate
7892 Sodium Chlorate
7857 Sodium Chlorate
7853 Sodium Chlorate
7872 Sodium Chlorate
7886 Sodium Chlorate
7871 Sodium Chlorate
7856 Sodium Chlorate
7870 Sodium Chlorate
7890 Sodium Chlorate
7864 Sodium Chlorate
7907 Sodium Chlorate
7888 Sodium Chlorate
7865 Sodium Chlorate
7869 Sodium Chlorate
6710 Sodium Formate
7095 Sodium Formate (liq & crystals)
6135 Sodium Sulfate (feedwater Oxygen Scavenger)
5647 Sodium Thiosulfate
7080 Sodium Thiosulfate
7134 Solvent, Waste
7111 Spray Insecticide
7129 Stain Repeller
7157 Stearic Acid (Emery Corp)
5600 sulfuric acid
7785 Sulfuric Acid
4644 sulphuric wash
6696 Synthrapol KB Control (PolyOxyEthylene, Alkyl Alcohol)
6395 Tanco
6345 Teno
6775 TENO with LE330, Antimony,water
6762 TENO with SYNTP 44%, H20 32%, Antimony Oxide 22%
6931 Tetra Bromo Bi Phenol (hand written)
6487 Tetra Bromo Bisphenol 4
6959 Tetra Bromo Ortho-Chlorotoluene
6956 Tetra Bromo O-Clorotoluene
6982 Tetra Butyl Ammonium Bromide

7062 Tetra Chloroethylene
7066 Tetra Chloroethylene / Waste (handwritten)
7121 TetraBromoBisPhenol
6556 TetraBromoBisPhenol
6503 TetraBromoBisPhenol A
6551 TetraBromoBisPhenol A
6570 TetraBromoBisPhenol A
6505 TetraBromoBisPhenyl
6504 TetraBromoBisPhenylDiAllyl Ether (Handwritten)
6565 Textel-28 (Pennwalt)
7229 Textile Chemical Flam Liq
7132 Toluene
7252 Toluene contaminated with Dichloromethane
7128 Toluene (Novick Chemical Co. Scranton PA.)
7114 Toluiene (Waste)
2441 tributyl phosphine
6467 Triton W-30 concentrate (Rohm & Haas)
7130 Triton X-155 90% (Rohm & Haas)
7137 Triton (Rhom & Haas)
7099 TSPP
6495 T-330 Mill Clean (Handwritten)
2783 UN-2924
6294 VCAR Latex
5288 Waltis 89 (washing soap)
7167 xylene
7142 Xylene, Pure (Amenol Drug & Chemical - Irvington NJ.)
5622 xylene layer - coupling wash
5779 xylene layer - coupling wash
7279 xylene (p-)
7131 Xylenes (Aldrich)
7196 X-Link 25-2873 (National Starch and Chemical Co.)
6779 (HN2)2CO
6770 (HN2)2CO
5743 (see additional information)
5565 _____ chloride (UN 1593)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

DATE: JAN 3 1992

SUBJECT: Hazardous Substances Tolled at White Chemical Corporation

FROM: Joseph A. Vona. Ph.D. Joseph A Vona phD

TO: John Higgins, Chief
Preparedness Section

The attached report describes in detail the specific chemicals "tolled" for a chemical company by White Chemical Corporation and their respective by-products and residues.

Some of the analytical data received was correlated with the waste products. This data provided the possibility of holding a chemical company responsible for the waste products based on the chemicals tolled.

Attachment

cc: Bruce Sprague
John Ulshoefer
Mark Pane
Bruce H. Aber
Michael Vanitollie
Silvina Fonseca
Mike Neill

BAF000027

This report is a supplement to the report "Hazardous Substances Produced Tolled at White Chemical Corp."

Products manufactured by White Chemical Corporation would always have by-products and waste residues. The type and quantity of the by-product and waste residues would be determined by the following:

- The other chemicals present which would result in interactions and concurrent reactions.
- Types of containers used for storage; i.e. iron drums could cause some catalytic changes.
- Effect of heat from exothermic reactions or sunlight upon storage.
- The period of storage.
- Environmental moisture.

A large number of products manufactured were carboxylic acid chlorides from carboxylic acids and phosphorous trichloride as raw materials.

Reaction may be represented as follows:

RCOOH	+	Pcl_3	--->Rcocl	+	Hcl	+ Phosphorous Derivatives
Carboxylic Acid		Phosphorous Trichloride	Acid Chloride		Hyrochloric Acid	

R may be any fatty acid, i.e. Caprylic acid, Capric acid, Lauric acid, etc.

Phosphorous trichloride, which readily decomposes upon contact with moisture, will yield hydrochloric acid and any one or all of the possible phosphorous compounds. Possible phosphorous compounds are:

Ortho-phosphoric acid, hypo-phosphoric acid, meta-phosphoric acid, pyro-phosphoric acid, hypo-phosphorous acid, ortho and pyro phosphorous acids; phosphorous oxychloride.

MAYBROOK -	Product Manufactured	Raw Materials
	Capryloyl chloride	Caprylic acid(Octanoic)
		Phosphorous Trichloride

Waste Residues and By-Products
Hydrochloric acid
Phosphorous compounds
Capryloyl chloride
Caprylic acid
(Octanoic acid)

There is analytical evidence of chlorides which would indicate that hydrochloric acid was present. Also, any capryloyl chloride could be readily hydrolyzed in the presence of moisture to caprylic acid (octanoic) and hydrochloric acid. All acid chlorides hydrolyze to yield hydrochloric acid and the corresponding carboxylic acid.

OHM Corp. (File A) has developed analytical evidence that chlorides were found and would indicate that hydrochloric acid was present. The following drums present analytical evidence that chlorides are present. DA-01, DA-03-06, DA-08-25, DA 27-31, DA-64, DA-65.

There is evidence of phosphorous as phosphoryl chloride (phosphorous oxychloride-$POCl^3$), Drum DA-16 - OHM Corp. (File A) Page 8.

Caprylic acid (Octanoic acid) was found in Drums (Reference File A) DA 10-11, DA 13-16, DA 18-19, DA 24-25.

Capricoyl chloride - Capric acid (decanoic acid)
Phosphorous trichloride

Waste Residues
- Hydrochloric acid
Phosphorous compounds
Capric acid

Evidence for hydrochloric acid and phosphorous compounds exist as noted above.

Analytical evidence for capric acid may be found in Drum DA-01. Although this is reported as methyl capricolate, it is possible that capric acid in the presence of methanol upon storage or under certain reaction conditions would produce methyl capricolate.

Myristoyl Chloride - Myristic acid (Tetradecanoic acid)
Phosphorous trichloride
Waste Residues
- Phosphorous acid
Phosphoric acid
Hydrochloric acid
Myristoyl chloride
Myristic acid

Evidence for hydrochloric acid and phosphorous compounds same as above. Analytical evidence for myristic acid (Tetradecanoic acid) may be found in Drum DA-08 (Reference File A, page 8). No evidence for myristoyl chloride.

There is no evidence for lauric acid, palmitic acid and oleic acid or their corresponding acid chlorides.

D & O

Pivaloyl Chloride - Pivalic acid
(2.2-dimethyl propanoic acid)
phosphorous trichloride

Waste Residues
- Hydrochloric acid
Phosphorous compounds
Pivalic acid

Analytical evidence for hydrochloric acid and phosphorous was noted above.

Analytical evidence for pivalic acid may be found in Reference File A; Drums DA-03, DA-10, DA 14-15, DA 17, DA 19, DA 24, DA 64-65.

No evidence available for Isononoic acid, 2-Ethyl hexoic acid, Neodecanoic, and their respective acid chlorides.

Capryloyl Chloride - See Above

Propionyl Chloride - Propionic acid
Phosphorous trichloride

Waste Residues
- Hydrochloric acid
Phosphorous compounds
Propionic acid

Analytical evidence for hydrochloric acid and phosphorous was noted above.

Analytical evidence for propionic acid may be found in Reference File A, Drums DA 10,11, DA 14,15,16,13,18. This is reported as methyl propionate. It is possible that propionic acid in the presence of methanol, upon storage or under certain reaction conditions would produce methyl propionate.

Phenyl Ethyl Bromide - Phenyl ethyl alcohol
Hydrobromic acid

Waste Residues
- Hydrobromic acid
Phenyl ethyl bromide
Phenyl ethyl alcohol

There is analytical evidence that bromides were present. This will support the presence of hydrobromic acid. It is possible that the bromide data could include phenyl ethyl bromide. However, since there is no analytical data to show the presence of the phenyl ethyl moiety, it may be difficult to conclude that phenyl ethyl bromide or alcohol exist.

In OHM Corp. (File A) report the drums reporting bromide include DA 01,02,03,04,05,06,08,09,10,11,12,13,14,15 DA 16-25, DA 27-31, DA 64,65.

Bromoacetic Acid - Mono-bromoacetic acid and Dibromoacetic and Hydrobromic acid may be present because the analytical data indicated bromide exists. The drums reporting bromide by OHM Corp. are noted above.

Acetic Acid - There is some analytical evidence that acetic acid is present. The OHM Corp. analytical data reports that methyl acetate exists (Drum DA 65, page 3, File A). It is possible that acetic acid upon standing in the presence of methyl alcohol would produce methyl acetate.

Bromine - Bromine may esixt as free bromine or may hydrolyze to hydrobromic acid. In either case it would be reported as bromide. The drums reporting bromide as noted above may be considered as evidence.

Cetyl Bromide - Cetyl alcohol, Cetyl Bromide
Hydrobromic acid

There is no analytical evidence for the existence of cetyl alcohol or cetyl bromide. Although the bromide data may include the cetyl bromide, it would be difficult to prove that the cetyl alcohol or cetyl bromide exist.

There is analytical evidence for the hydrobromic acid; i.e. the OHM Corp. (File A) reports drums containing bromide. See above.

	Waste Residues
Decyl Bromide -	Decyl bromide
	Decyl alcohol
	Hydrobromic acid

Same as above for Cetyl bromide.

	Waste Residues
Myristyl Bromide -	Myristyl bromide
	Myristyl alcohol
	hydrobromic acid

As above, there is no analytical evidence for myristyl bromide or alcohol.

There is analytical evidence for the hydrobromic acid as noted above.

	Waste Residues
Decabromodiphenyl Oxide -	Hydrobromic acid
	Diphenyl oxide
	Decabromodiphenyl oxide
	Ethylene dichloride
	Tetrachloroethane
	Partially brominated diphenyl oxide
	Partially brominated chlorinated diphenyl oxide
	Bromine

There is analytical evidence for hydrobromic acid as noted above in the bromide drums.

There is analytical data for diphenyl oxide. OHM Corp. reports that phenyl ether(diphenyl oxide) was found in drum DA-06, page 1, OHM Corp (File A).

Decabromodiphenyl Oxide - No evidence exists.

Ethylene Dichloride - There is analytical evidence, OHM Report (File A) pages 1 and 2, the following drums contain ethylene dichloride, i.e. Drums DA 02-04,06,11, DA 20-22,27-31, DA 64.

Tetrachloroethane - Symmetrical tetrachloroethane-1,1,2,2,tetrachloroethane

There is analytical evidence, OHM Report (File A) page 1, the following drums contain tetrathloroethane as 1,1,2,2, tetrachloroethane, DA 01,04,20,29,30.

Partially brominated diphenyl oxide - no evidence exists.

Partially brominated, chlorinated diphenyl oxide - no evidence exists.

Bromine - See above.

	Waste Residues
Hydriodic Acid -	Iodine
	Hydriodic acid
	Red phosphorous
	Phosphorous acid
	Phosphoric acid

There is evidence for iodine and hydriodic acid OHM Corp. Report File A page 6. Iodine exists in Drums DA 17,14,64,65.

Red Phosphorous - Readily decomposes in air and could form any of the phosphorous compounds discussed at the the beginning of this report. There is analytical evidence of phosphorous as phosphoryl chloride, Drum DA 16, File A page 8.

Phosphorous acid, Phosphoric acid - Drum DA 16 as above.

HEXAGON

	Waste Residues
Di-para-xylene -	Para-Xylene
	Xylene
	P-methylbenzyl chloride
	Trimethylamine
	Acetone

Xylene is the general name for ortho, meta or para-xylene. There is evidence for the xylene in OHM Report, Pages 8 and 9, Drums DA 01,12,18,21,22,25.

P-methylbenzyl chloride - No evidence.

However, in the presence of moisture the chemical hydrolyzes to yield chloride ion. There is evidence for chloride ion. (See FileA)
pages 4 and 5.

Trimethylamine - No evidence.

Acetone - Analytical evidence exists (File 8, page 3)
Drum DA 64.

Propionyl Chloride - See D & O Section

Capryloyl Chloride - See D & O Section
See Maybrook Section

Pivaloyl Chloride - See D & O Section

Decyl Bromide - See D & O Section

Myristyl Bromide - See D & O Section

MONSANTO

	Waste Residues
Pelargonoyl Chloride -	Phosphorous acid
	Phosphoric acid
	Hydrochloric acid
	Pelargonoyl chloride
	Pelargonic acid
	Pelargonic anhydride

Phosphorous acid, phosphoric acid and hydrochloric acid were discussed above.

No evidence exists for pelargonoyl chloride or pelargonic acid.

Capryloyl Chloride - See D & O above.

RHONE-POULENC

Capryloyl Chloride - See D & O above.

TROY

Isostearoyl Chloride - Difficult to prove.

PPG

Decabromodiphenyl Oxide - Discussed above.

Octabromodephenyl Oxide - Discussed above.

Pivaloyl Chloride - See above.

HUMMEL

Dimethyl oxalate -	Oxalic acid
	Dimethyl oxalate
	Methyl alcohol
	Toluene

There is no analytical evidence for oxalic acid, dimethyl oxalate or methyl alcohol.

There is evidence for toluene OHM Report (File A) page 8, reports toluene in Drums DA 01, DA 14,18,19,23.

	Waste Residues
Diethyl Oxalate -	Oxalic acid
	Diethyl oxalate
	Ethyl alcohol
	Toluene

No analytical evidence for oxalic acid, diethyl oxalate, ethyl alcohol.

There is evidence for toluene. See previous comment.

	Waste Residues
Dipentyl Oxalate -	Oxalic acid
	Dipentyl oxalate
	Pentyl alcohol
	Toluene

There is no analytical evidence for oxalic acid, dipentyl oxalate or pentyl alcohol.

There is evidence for toluene. See previous comment.

	Waste Residues
Ammonium Oxalate -	Oxalic acid
	Ammonium oxalate
	Ammonium hydroxide

No analytical evidence for oxalic acid, ammonium oxalate, ammonium hydroxide.

INOLEX

	Waste Residues
Myristoyl Chloride -	Phosphorous acid
	Phosphoric acid
	Hydrochloric acid
	Myristoyl chloride
	Myristic acid

See Section under MAYBROOK

PROPOSED COMPOUNDS TO BE ANALYZED FOR
AT THE WHITE CHEMICAL SITE

Products	Wastes	Companies	DAs	Method
Capryloyl chloride	Caprylic acid* (octanoic acid) Phosphorous acid Phosphoric acid Hydrochloric acid Capryloyl chloride	Ma, DO, He, Mo, RP	10,11,13,16 18,19,24,25 80-82,102,108	8270(BNA
Pivaloyl chloride	Pivalic acid* (2,2 dimethyl propanoic acid) Phosphorous acid Phosphoric acid Hydrochloric acid Pivaloyl chloride	DO, He, PPG	03,10,14,15 17,19,24,64 65 80-82,108	8270(BNA
Myristoyl chloride	Myristic acid* (tetradecanoic) Myristoyl cholide Hydrochloric acid Phosphorous acid Phosphoric acid	Ma, In	08,86,87 107	8270(BNA
Lauroyl chloride	Lauric acid* (dodecanoic acid) Phosphorous acid Phosphoric acid Hydrochloric acid Lauroyl chloride	Ma	32?,97,102	8270(BNA
Bromoacetic acid	Acetic acid* Hydrobromic acid Bromine	DO	#6803, 5771 65	
Di-para-xylene	Xylene* Acetone* Trimethyl amine* Para-xylene	He	tank #90 01,12,18, 21-25,52 33,35,36,38,44 50-52,69	8240 (volatile
Oxalate compounds	Oxalic acid* (Ethane dioic acid) Toluene** Methyl alcohol Ammonium hydroxide*	Hu	**01,14,18, 19,23,36 42,43,56,109 #7085 #47 Hand Carton Label	8240 (volatile

* Raw material supplied by respondent
** DAs & and Method for toluene

Products	Wastes	Companies	DAs	Metho
Ethylene vinyl chloride copolymer (Airflex-4930)	Ethylene vinyl chloride copolymer (Airflex-4530)	AP	Bldg 34 - 519-521 & #7262	
Decabromo-diphenyl oxide	**Diphenyl oxide*^ (phenylether)** Ethylene dichloride Bromine	PPG,DO,Mo^	Bldg 35 - 572 &06	
Pelargonoyl chloride	**Pelargonic acid* (nonanoic acid)** Pelargonyl chloride Phosphorous acid Phosphoric acid	Mo		
Isostearoyl chloride	**Isostearic acid*** Isostearoyl chloride Phosphoric acid Phosphorous acid	Tr		
	Phosphorous trichloride	RP	tank #80	

* **Raw material supplied by respondent**
^ Mo label

	MAYBROOK	D & O	HEXAGON	Monsanto	Rhone Poulenc	TROY	PPG	HUMMEL	INOLEX	AIR PRODUCTS
CAPRYLIC (OCTANOIC)	✓	✓		✓	✓					
CAPRIC (DECANOIC)	* ✓									
MYRISTIC (TETRADECANOIC)	✓								✓	✓
AIRFLEX										
PIVALIC (2,2, DEMETHYL PROPIONIC ACID)		✓	✓				✓			
DIPHENYL OXIDE (PHENYL ETHER)		✓		* BLDG 35 ✓			✓			
EDC		✓								
~~TETRA GE~~										
Tetrachloro ethane 1,1,2,2		✓								
IODINE		✓								
PARA-xylene			✓							
ACETONE			✓							
TOLUENE								✓		
PCL 3					✓					
HYDROCHLORIC ACID					✓ 35					
EVCC										✓ 34
CAPRYONYL CHLORIDE	✓ 34	✓ 34		✓ 34	✓ 34					
LAURCYL BROMIDE	✓ 34									
ACETIC ACID 35										

MAYBROOK — CAPRYLIC ACID DA-10, DA11, DA13, DA16, DA18, DA19
OCTANOIC

MAYBROOK — MYRISTIC ACID DA C14 (TETRADECANOIC)

D&O — Pivalic Acid (2,2 dimethyl propionic acid)
DA3, DA19, 4, 15, 17, 19, 24

D&O — (1,1,22, Tetrachloroethane) 01, 04, 20, 29, 30,

D&O — Diphenyl oxide (phenyl ether) DA06

D&O — Ethylene dichloride DA 02, 04, 06, 11, 20, 21, 22, 27, 28, 29, 30, 31, 64

HEXAGON — PARA xylene · T90 DA01, 12, 18, 21, 22, 23, 24, 25

HEXAGON — ACETONE DA 64

Monsanto — Caprylic acid · see MAYBROOK (OCTANOIC ACID)

Rhone Poulenc — Caprylic acid (OCTANOIC ACID) see Maybrook

TROY — DIFFICULT TO PROVE

PPG — Pivalic Acid (2,2, dimethyl propionic acid)
see MAYBROOK

Hummel Toluene DA 01, 14, 10, 19, 23

Inolex ~~Myristoyl Chl~~

Myristic acid (Tetradecanoic acid)
See Myristoyl

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

DATE: JAN 8 1992

SUBJECT: Analytical Evidence for the Existence of Waste Products
White Chemical Corporation

FROM: Joseph A. Vona, Ph.D. Joseph A Vona phD

TO: John Higgins, Chief
Preparedness Section

Column 5 should be used in conjunction with the last table "Hazardous Substances Produced Tolled at White Chemical Corporation". Both tables are attached.

Attachments

cc: B. Sprague
J. Ulshoefer
M. Pane
B. Aber
M. Vanitollie
S. Fonseca
M. Neill

BAF000028

COLUMN 5

ANALYTICAL EVIDENCE FOR THE EXISTENCE OF WASTE PRODUCTS

MAYBROOK

CAPRYLOYL CHLORIDE

Phosphorous and Phosphoric acid - There is evidence for phosphorous. It is reported as Phosphoryl chloride (phosphorous oxychloride-$POCl_3$). Drums DA-16, OHM Corp. File A, p.8, OHM Report.

Hydrochloric acid - There is analytical evidence for hydrochloric acid which is reported as chlorides. It should be noted that capryloyl chloride will hydrolyze in the presence of moisture to caprylic acid and hydrochloric acid. See OHM Corp. Report File A, pp. 4,5, Drums DA 01,02-06, 08-25, 27-31,64,65 which report chloride.

Capryloyl chloride - No specific evidence.

Caprylic acid - (Octanoic acid) was found in Drums(FileA) DA-10,11,13,16,18,19,24,25.

Caprylic anhydride - No specific evidence. Anhydrides in the presence of moisture will yield the acid, i.e. caprylic acid,(octanoic acid).

CAPRICOYL CHLORIDE

Phosphorous acid and phosphoric acid - Same as above.

Hydrochloric acid - Same as above.

Capricoyl chloride - No specific evidence.

Capric acid - (Decanoic acid)Analytical evidence for capric acid may be found in drum DA-01(File A-p.5). Although this is reported as methyl capricolate, it is possible that capric acid in the presence of methonol upon storage or under certain reaction conditions would produce methyl capricolate(methyl decanoate).

Capric anhydride - No specific evidence. Anhydrides in presence of moisture will yield the acid-i.e.capric(decanoic acid).

LAUROYL CHLORIDE

Phosphorous acid, phosphoric acid and hydrochloric acid Same as above.

Lauroyl chloride - No specific evidence.

4 Lauric acid - No specific evidence.

Lauric anhydride - No specific evidence.

MYRISTOYL CHLORIDE

Phosphorous acid, phosphoric acid, hydrochloric acid
See above.

Myristoyl chloride - No specific evidence.

3 Myristic acid(Tetradecanoic acid) - Analytical evidence was found in Drum DA-08(File A,p.8).

Myristic anhydride - No specific evidence.

PALMITOYL CHLORIDE

Phosphorous acid, phosphoric acid, hydrochloric acid
Same as above.

Palmitoyl chloride - No specific evidence.

Palmitic acid(hexadecocroic acid) - No specific evidence.

Palmitic anhydride - No specific evidence.

OLEYOYL CHLORIDE

Phosphorous acid, phosphoric acid, hydrochloric acid
See above.

Oleyoyl chloride - No specific evidence.

Oleic acid - No specific evidence.

Oleic anhydride - No specific evidence.

AIR PRODUCTS

5 Compounded a brominated material with Ethylene-vinyl chloride copolymer (airflex'-4930).

They have discontinued selling a brominated compounded airflex'(4930) called originally airflex'4530.

D & O

Isononoyl chloride, 2-Ethyl hexanoyl chloride, Neodecanoyl chloride - No evidence exists.

Pivaloyl chloride

Phosphorous acid, phosphoric acid, hydrochloric acid
See above.

Pivaloyl chloride - No evidence exists.

Pivalic acid - (2,2,demethyl propionic acid)Analytical evidence is found in reference File A, drums DA-03,10,14,15,17,19,24,64,65.

Pivalic anhydride - No specific evidence.

Capryloyl chloride - See Maybrook

Propionyl chloride - Analytical evidence for phosphorous, phosphoric and hydrochloric acid, see above.

Propionyl chloride - No specific evidence.

Propionic acid - Analytical evidence may be found in Reference File A, drums DA-10,11 DA-14,15,16,13,18(p.8); this is reported as methyl propionate. It is possible that propionic acid in the presence of methanol, upon storage or other conditions will form methyl propionate.

Phenyl ethyl bromide

Hydrobromic acid - There is analytical evidence that bromides are present. This will support the presence of hydrobromic acid. OHM Corp. (File A) reports bromides present in drums DA-01,02,03,04,05,06,08,09,10,11,12 and 13,14,15,16-25,27-31,64,65.

Phenyl ethyl bromide - It is possible that the bromide data could include phenyl ethyl bromide. However, since there is no analytical data to show the presence of the phenyl ethyl moiety, it may be difficult to conclude that phenyl ethyl bromide or alcohol exist.

Bromoacetic acid - Monobromoacetic acid, dibromoacetic acid tribromoacetic acid and hydrobromic acid may be present because the analytical data indicates that bromide exists. The drums reporting bromide by OHM Corp. are noted above.

Acetic acid - There is analytical evidence that acetic acid is present. The OHM Corp. analytic data reports that methyl acetate exists, drums DA-65 File A, p.3. It is possible that acetic acid upon standing in the presence of methyl alcohol would produce methyl acetate.

Cetyl bromide

Cetyl alcohol, cetyl bromide - There is no analytical data for the existence of cetyl alcohol or bromide. Although the bromide data may include cetyl bromide.

Hydrobromic acid - There is analytical evidence for the hydrobromic acid, see bromide data under phenyl ethyl bromide.

Decyl bromide - Same as above for cetyl bromide.

Myristyl bromide - Same as above for cetyl bromide.

Decabromodiphenyl oxide

Hydrobromic acid - There is analytical evidence; see above.

Diphenyl oxide - There is analytical evidence for diphenyl oxide. OHM reports that phenyl ether (diphenyl oxide) was found in drums DA-06, File A, p.1.

Decabromodiphenyl oxide - No analytical evidence.

Ethylene dichloride - There is analytical evidence-OHM Report, File A, pp. 1 and 2 indicate that the following drums contain ethylene dichloride, Drums DA-02-04,06,11 and 20-22,27-31,64.

Tetrachloroethane - Symmetrical tetrachloro-1,1,22 tetrochloroethane. There is analytical evidence, OHM Report, File A, p.1, the following drums contain tetrachloroethane as 1,1,22 tetrachloroethane, Drums DA 01,04,20,29,30.

Partially brominated diphenyl oxide - no evidence exists.

Partially brominated chlorinated diphenyl oxide
No analytical evidence exists.

Bromine - There is evidence of bromide; some bromine may be present as bromide. See phenyl ethyl bromide for drums containing bromide.

Hydriodic acid

Iodine and Hydriodic acid - There is evidence for iodine and hydriodic acid. OHM Corp. Report, File A, p.6; iodine exists in drums DA-17,24,64,65.

Phosphorous acid, phosphoric acid - Red phosphorous readily decomposes in air to form several possible different phosphorous and phosphoric acid. The analytical evidence for phosphorous is represented by Drums DA-16, File A, p.8 as phosphoryl chloride.

HEXAGON

7 **Di-para-xylene**

Para-xylene - Xylene is the generic name for ortho, meta para xylene. There is evidence for the xylenes in OHM Report, File A, pp.8,9;Drums DA-01,12,18,21,22-25.

P methylbenzyl chloride - No direct evidence. However, in the presence of moisture, it will hydrolyze to yield chloride ion. There is evidence for chloride ion, File A, pp.4-5. See Maybrook hydrochloric acid for specific drums.

Trimethylamine - No analytical evidence.

Acetone - Analytical evidence exists, File A,p.3,DrumsDA-64.

Propionyl chloride - See D & O Section

Capryloyl chloride - See D & O Section and MAYBROOK Section

Pivaloyl chloride - See D & O Section

Decyl bromide - See D & O Section

Myristyl bromide - See D & O Section

MONSANTO

6 **Pelargonoyl chloride** - Phosphorous, phosphoric and hydrochloric acid were discussed above. See MAYBROOK.

Pelargonoyl chloride, pelargonic acid, pelargonic anhydride No analytical evidence.

Capryloyl chloride - See MAYBROOK and D & O

RHONE-POULENC

Capryloyl chloride - See MAYBROOK and D & O

TROY

Isostearoyl chloride - Difficult to prove.

PPG

Decabromodiphenyl oxide - See D & O

Octabromodiphenyl oxide - See D & O

Pivaloyl chloride - See D & O and HEXAGON

HUMMEL

Dimethyl oxalate

Oxalic acid, dimethyl oxalate, methyl alcohol - There is no analytical evidence for any of these chemicals.

Toluene - There is analytical evidence in toluene. OHM Report, File A, p.8, Drums DA-01,14,18,19,23.

Diethyl oxalate - No analytical evidence exists for oxalic acid, dipentyl oxalate, ethyl alcohol.

Toluene - See previous comment.

Dipentyl oxalate - No analytical evidence for oxalic acid, dipentyl oxalate or pentyl alcohol.

Toluene - See previous comment.

Ammonium oxalate - No analytical evidence for oxalic acid, ammonium oxalate or ammonium hydroxide.

INOLEX

Myristoyl chloride - See Section under MAYBROOK.

HAZARDOUS SUBSTANCES PRODUCED TOLLED AT WHITE CHEMICAL CORPORATION

COMPANY	CHEMICALS PRODUCED BY WHITE CHEMICAL	CHEMICAL RAW MATERIALS OWNED & SUPPLIED BY RESPONDENT	CHEMICALS SUPPLIED BY WHITE CHEMICAL ON BEHALF OF RESPONDENT	WASTE RESIDUES & BY PRODUCTS
MAYBROOK	Acid chlorides of the coconut fatty acids:	Coconut fatty acids:		Phosphorous acid Phosphoric acid Hydrochloric acid
*	Capryloyl chloride	Caprylic acid (Octanoic acid)	Phosphorous Trichloride	Capryloyl chloride Caprylic acid Caprylic anhydride
	Capricoyl chloride	Capric acid (Decanoic acid)	Phosphorous Trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Capricoyl chloride Capric acid Capric anhydride
*	Lauroyl chloride	Lauric acid (Dodecanoic acid)	Phosphorous Trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Lauroyl chloride Lauric acid Lauric anhydride
	Myristoyl chloride	Myristic acid (Tetradecanoic acid)	Phosphorous Trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Myristoyl chloride Myristic acid Myristic anhydride
	Palmitoyl chloride	Palmitic acid (Hexadecanoic acid)	Phosphorous Trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Palmitoyl chloride Palmitic acid Palmitic anhydride

MAYBROOK	Oleyoyl chloride	Oleic acid	Phosphorous Trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Oleyoyl chloride Oleic acid Oleic anhydride
AIR PRODUCTS	Compounded a brominated material with Ethylene-vinyl chloride Copolymer (airflex^{r}-4930)	Airflex^{r}-4530-ethylene-vinyl chloride copolymer	Calibran ND-74	Possibly the compounded Airflex^{r}4530 and Calibran ND-74

D & O	Isononoyl chloride	Isononoic acid	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Isononoyl chloride Isononoic acid Isononoic anhydride
	2-Ethyl hexanoyl	2-Ethyl hexoic acid	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid 2-Ethyl hexanoyl chloride 2-Ethyl hexoic acid 2-Ethyl hexoic anhydride
	Neodecanoyl chloride	Neodecanoic acid	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Neodecanoyl chloride Neodeconoic acid Neodecanoic anhydride
	Pivaloyl chloride	Pivalic acid (2.2 dimethyl propanoic acid)	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Pivaloyl chloride Pivalic acid Pivalic anhydride
	Capryloyl chloride	Caprylic acid	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Capryloyl chloride Caprylic acid Caprylic anhydride
	Propionyl chloride	Propionic acid	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Propionyl chloride Propionic acid Propionic anhydride
	Phenyl ethyl bromide	Phenyethyl alcohol Hydrobromic acid	Hydrobromic acid	Hydrobromic acid Phenyl ethyl bromide Phenyl ethyl alcohol

D & O	Bromoacetic acid	Acetic acid	Bromine	Mono-bromoacetic acid Dibromoacetic acid Tribromoacetic acid Acetic acid Hydrobromic acid Bromine
	Cetyl bromide	Cetyl alcohol Hydrobromic acid	Hydrobromic acid	Cetyl bromide Cetyl alcohol Hydrobromic acid
	Decyl bromide	Decyl alcohol Hydrobromic acid	Hydrobromic acid	Decyl bromide Decyl alcohol Hydrobromic acid
	Myristyl bromide	Myristyl alcohol Hydrobromic acid	Hydrobromic acid	Hydrobromic acid Myristyl bromide Myristyl alcohol
	Decabromodiphenyl oxide	Diphenyl oxide Ethylene dichloride	Bromine	Hydrobromic acid Diphenyl oxide Decabromodiphenyl oxide Ethylene dichloride Tetrachloroethane Partially brominated diphenyl oxide Partially brominated chlorinated diphenyl oxide Bromine
	Hydriodic acid	Iodine Red Phosphorus	Red Phosphorus	Iodine Hydriodic acid Phosphorous acid Phosphoric acid
HEXAGON	Di-para-xylene	Xylene P-methylbenzyl chloride Trimethylamine Acetone	None	Para-xylene Xylene P-methylbenzyl chloride Trimethylamine (in acetone)? Acetone

HEXAGON	Propionyl chloride	Propionic acid	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Propionyl chloride Propionic acid Propionic anhydride
	Capryloyl chloride	Caprylic acid Phosphorous trichloride	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Capryloyl chloride Caprylic acid Caprylic anhydride
	Pivaloyl chloride	Pivalic acid Phosphorous trichloride	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Pivaloyl chloride Pivalic acid Pivalic anhydride
	Decyl bromide	Decyl alcohol Hydrobromic acid	Hydrobromic acid	Hydrobromic acid Decyl bromide Decyl alcohol
	Myristyl bromide	Myristyl alcohol Hydrobromic acid	Hydrobromic acid	Hydrobromic acid Myristyl bromide Myristyl alcohol

MONSANTO	Pelargonoyl chloride	Pelargonic acid Phosphorous trichloride	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Pelargonoyl chloride Pelargonic acid Pelargonic anhydride
	Capryloyl chloride	Caprylic acid Phpsphorous trichloride	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Capryloyl chloride Caprylic acid Caprylic anhydride
RHONE-POULENC	Capryloyl chloride	Caprylic acid Phosphorous trichloride	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Capryloyl chloride Caprylic acid Caprylic anhydride
TROY	Isostearoyl chloride	Isostearic acid Phosphorous trichloride	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Isostearoyl chloride Isostearic acid Isostearic anhydride
	Di-Isostearate This should be polyethyl isostearate.	Isostearoyl chloride Polyethyleneglycol (Carbowax®) Propyleneglycol	None	Hydrochloric acid Polyethylisostearate Isostearoyl chloride Polyethyleneglycol (Carbowax) Propyleneglycol

PPG	Decabromodiphenyl oxide	Diphenyl oxide Ethylene dichloride Bromine	None	Hydrobromic acid Diphenyl oxide Decabromodiphenyl oxide Ethylene dichloride Tetrachloroethane Partially brominated diphenyl oxide Partially brominated chloridated diphenyl oxide Bromine
	Octabromodiphenyl oxide	Diphenyl oxide Ethylene dichloride Bromine	None	Hydrobromic acid Diphenyl oxide Octabromodyphenyl oxide Ethylene dechloride Tetrachloroethane Brominated derivatives of diphenyl oxide Brominated chlorinated derivatives of diphenyl oxide
PPG	Pivaloyl chloride	Pivalic acid Phosphorous trichloride	Phosphorous tichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Pivaloyl chloride Pivalic acid Pivalic anhydride

HUMMEL	Dimethyl oxalate	Oxalic acid Methyl alcohol Toluene	None	Oxalic acid Demethyl oxalate Methyl alcohol Toluene
	Diethyl oxalate	Oxalic acid Methyl alcohol Toluene	None	Oxalic acid Diethyl oxalate Ethyl alcohol Toluene
	Dipentyl oxalate	Oxalic acid Pentyl alcohol Toluene	None	Oxalic acid Dipentyl oxalate Pentyl alcohol Toluene
	Ammonium oxalate	Oxalic acid Ammonium hydroxide	None	Oxalic acid Ammonium oxalate Ammonium hydroxide
INOLEX	Myristoyl chloride	Myristic acid Phosphorous trichloride	Phosphorous trichloride	Phosphorous acid Phosphoric acid Hydrochloric acid Myristoyl chloride Myristic acid Myristic anhydride

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

APR 1 1992

JACOB K. JAVITS FEDERAL BUILDING

NEW YORK, NEW YORK 10278

EXPRESS MAIL
RETURN RECEIPT REQUESTED

Ted Kuniaski, President
AZS Corporation
229 Peachtree St., N.E.
Suite 2400
Atlanta, Georgia 30303-1629

Paul M. King, Dir. Envt'l Aff.
PPG Industries, Inc.
One PPG Place
Pittsburgh, PA. 15272

Harry Zafran, President
D & O Chemicals, Inc.
291 South Van Brunt St.
Englewood, N.J. 07631

James White and
White Chemical Corporation
100 Manhattan Ave., Apt. 1906
Union City, N.J. 07087

Mark Dugan, Vice President
Hummel Croton, Inc.
10 Harmich Road
South Plainfield, N.J. 07080-4899

Lee Smith, President
Hexagon Enterprises, Inc.
60 Midvale Road
Mountain Lakes, N.J. 07046

Monsanto Company, Inc.
800 N. Lindbergh Blvd.
St. Louis, Missouri 63167
Attn: President

Rhone-Poulenc Ag Co.
P.O. Box 12614 (Rm. 2127)
Res. Triangle Park, N.C. 22709
Attn: President

Donald H. Francis, President
Maybrook, Inc.
Plant & Administration Building
570 Broadway
Lawrence, MA. 01842

Inolex Chemical Company
Jackson & Swanson Street
Philadelphia, PA. 19148
Attn: President

Re: White Chemical Corporation Superfund Site -
Administrative Order Index No. II-CERCLA-20103

Dear Sir or Madam:

Enclosed please find a unilateral Administrative Order issued to your company identified above. This Order is being issued by the United States Environmental Protection Agency ("EPA") under Section 106 of the Comprehensive Environmental Response, Compensation & Liability Act of 1980 ("CERCLA") for performance

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of a response action at the White Chemical Corporation Superfund Site ("the Site"), Newark, New Jersey. The enclosed Order, Index No. II-CERCLA-20103, was signed by the Regional Administrator on March 31, 1992, and by its terms will become effective on April 10, 1992.

In accordance with Section XXVI of the enclosed Order ("Opportunity to Confer"), you or other representatives of your company may confer with EPA to discuss the implementation of this Order, prior to its effective date.

Additionally, in accordance with Section VII of the enclosed Order (Notice of Intent to Comply), you shall provide, not later than five (5) calendar days after the effective date of this Order, written notice to EPA's Remedial Project Manager, Silvina Fonseca, Rm. 711, with a copy of the letter to Assistant Regional Counsel, Bruce Aber, Rm. 309, facsimile (212) 264-9694, stating whether your company will comply with the terms of this Order.

Please call Ms. Silvina Fonseca of my staff at (212) 264-7604 if you have any questions concerning this matter. All calls from attorneys should be directed to Bruce Aber, Assistant Regional Counsel at (212) 264-5547.

Sincerely yours,

Kathleen C. Callahan

Kathleen C. Callahan, Director
Emergency & Remedial Response Division

Enclosure

cc: John Scagnelli, Esquire
Don Volkert, Esquire
Andrew B. Robins, Esquire
Kathleen M. Whitby, Esquire
Nancy B. Rohn, Esquire

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

IN THE MATTER OF White Chemical Corporation Site AZS Corporation White Chemical Corporation James White PPG Industries, Inc. D & O Chemical Co., Inc. Hexagon Enterprises, Inc. Hummel Croton, Inc. Monsanto Company, Inc. Rhone-Poulenc, Ag. Co. Maybrook, Inc. Inolex Chemical Company, Inc. Respondents Proceeding under Section 106(a) of the Comprehensive Environmental Response, Compensation and Liability Act, as amended, 42 U.S.C. §9606(a).	ADMINISTRATIVE ORDER Index No.II-CERCLA-20103

I. JURISDICTION

1. This Administrative Order (the "Order") is issued to the Respondents by the United States Environmental Protection Agency ("EPA") pursuant to the authority vested in the President of the United States by Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), as amended, 42 U.S.C. §9601 et seq. This authority was delegated to the Administrator of the EPA by Executive Order 12580, dated January 23, 1987, and duly redelegated to the Regional Administrator of EPA, Region II. Notice of this Order has been given to the New Jersey Department of Environmental Protection and Energy ("NJDEPE") pursuant to Section 106(a) of CERCLA, 42 U.S.C. §9606(a).

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ATTACHMENTS:

I. Statement of Work

II. Record of Decision

II. DEFINITIONS

2. Unless noted to the contrary, the terms in this Order shall have the same meaning assigned to them in CERCLA, 42 U.S.C. §9601 et seq. and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300, as amended ("NCP"). As used in this Order, unless the context clearly requires some other meaning, the following terms shall have the following meanings:

A. Day (or "day") shall mean calendar day.

B. Hazardous Substance shall mean any substance that falls within the definition of a "hazardous substance" as that term is defined in Section 101(14) of CERCLA, 42 U.S.C. §9601(14), and shall also mean any mixture(s) containing any such hazardous substance(s) at any concentration.

C. Paragraph shall mean a portion of this Order identified by an arabic numeral.

D. Performance Standards shall mean those cleanup standards, standards of control, and other substantive requirements, criteria or limitations, identified in the Record of Decision and Statement of Work, that the Response Action and Work required by this Order must attain and maintain.

E. Project Coordinator shall mean the person designated by the Respondents who will be charged with the duty of being at all times knowledgeable of the performance of all Work performed pursuant to this Order.

F. Record of Decision or ROD shall mean that document issued by EPA on September 26, 1991 and all attachments thereto, in which the remedial alternative for the Site was selected by the Regional Administrator of EPA Region II. The Record of Decision is incorporated into this Order and is an enforceable part of this Order. The ROD is attached to this Order as Attachment II.

G. Remedy shall mean the selected remedial alternative set forth in the Record of Decision and as further described in the Statement of Work and implemented and/or modified pursuant to this Order.

H. Respondents shall mean the parties as named in the caption to this Order, and includes their officers, employees, agents, subsidiaries, assigns and successors.

I. Response Action shall mean those activities to be undertaken by Respondents to implement the final plans and

specifications submitted by Respondents pursuant to the Response Action Work Plan Report approved by EPA, including any additional activities pursuant to this Order and the Statement of Work and its required schedules, plans or reports.

J. Response Costs shall mean all costs, including, but not limited to, direct costs, indirect costs, and accrued interest incurred by the United States to perform or support response actions relating to the Site. Response costs also include, but are not limited to, the costs of overseeing the Work, such as the costs of reviewing or developing plans, reports and other items pursuant to this Order and costs associated with verifying the Work.

K. Section shall mean a portion of this Order identified by a roman numeral and includes one or more Paragraphs.

L. Site shall mean the White Chemical Corporation Superfund Site, located at Block 3782, Lot 107, on the Tax Map of Essex County, 660 Frelinghuysen Avenue, Essex County, Newark, New Jersey. The Site encompasses real property approximately four and one half acres in size, where White Chemical Corporation, an inactive facility, formerly manufactured acid chlorides, alkyl bromides and brominated flame retardant compounds. The Site also includes any other real property located outside the boundaries of Block 3782, Lot 107, identified above, where hazardous substances may have migrated or threaten to migrate.

M. State shall mean the State of New Jersey.

N. Statement of Work or SOW shall mean the Document which is attached to this Order, labeled Attachment I. The Statement of Work is incorporated into this Order and is an enforceable part of this Order.

O. United States shall mean the United States of America, including but not limited to, the United States Environmental Protection Agency.

P. Waste Material shall mean any substance which meets the definition of any one or more of the following:

(1) a "hazardous substance" as that term is defined in Section 101(14) of CERCLA, 42 U.S.C. §9601(14); or

(2) a "pollutant or contaminant" as those terms are defined in Section 101(33) of CERCLA, 42 U.S.C. §9601(33); or

(3) any solid waste under Section 1004 (27) of the federal Resource Conservation & Recovery Act (RCRA), 42 U.S.C. §6903(27); or

(4) any mixture containing any of the constituents noted in (1), (2), or (3), above.

Q. Work shall mean all Work and other activities that Respondents are required to perform under this Order, including, but not limited to, Response Action and achievement of Performance Standards for the Remedy, and any activities required to be undertaken pursuant to this Order.

III. FINDINGS OF FACT

3. The White Chemical Corporation Site ("the Site") is a 4.4-acre, inactive facility located at 660 Frelinghuysen Avenue in a heavily populated and industrialized area of Newark, Essex County, New Jersey (Figure 1). The Site is bordered to the north, south, and west by manufacturing facilities, and to the east by Conrail and Amtrak rail lines. Approximately one-half mile further east is Newark International Airport. Weequahic Park, several large housing complexes, and several high-rise senior citizen residences are present near the Site.

4. Five major buildings are located on the Site, as well as three smaller, facility support buildings. Tanks containing Waste Material are present in three areas of the Site, and 55-gallon drums containing Waste Material are located throughout an area east of the buildings. The Site is secured by a chain-link fence.

5. Respondents, White Chemical Corporation ("White Chemical") and James White, conducted business operations at the Site under a lease agreement with the landowner and Respondent, AZS Corporation ("AZS"), from August 1982 until October 1990. White Chemical manufactured acid chlorides, alkyl bromides and brominated flame retardant compounds. In addition to being a chemical manufacturer in its own right, White Chemical at times manufactured products for other persons using materials which were both supplied and owned by those persons throughout the process.

6. White Chemical operated under the protection of Chapter 11 of the bankruptcy code from October 1989 until October 1990, when the bankruptcy was dismissed by the bankruptcy court.

7. On September 8, 1989, the New Jersey Department of Environmental Protection and Energy (NJDEPE) conducted a compliance inspection under the Resource Conservation and Recovery Act of 1976, 42 U.S.C. §6901 et seq. at the White Chemical Corporation facility. The inspection revealed numerous violations of the New Jersey Spill Compensation and Control Act (the "Spill Act"), New Jersey Statute Annotated (N.J.S.A.),

§58:10-23.11 et seq. and the New Jersey Solid Waste Management Act ("the Solid Waste Management Act"), N.J.S.A. §13:1E-1 et seq. and hazardous waste regulations promulgated pursuant thereto, N.J.A.C. 7:26-1 et seq. Consequently, NJDEPE issued Notice of Violations for the following hazardous waste violations: failing to label drums containing waste materials, operating a hazardous waste treatment facility without a permit, leaking drums, open containers, and inadequate aisle space.

8. In March, 1990, NJDEPE reinspected the White Chemical facility and recorded 9,063 drums on site. Many drums contained Waste Materials and continued to be improperly stored. Consequently, on March 15, 1990, NJDEPE issued a Notice of Civil Administrative Penalty Assessment under the Solid Waste Management Act in an amount of $86,500.00 against White Chemical and an Administrative Order requiring White Chemical to submit a Verification of Compliance indicating that it had corrected the violations of the Spill Act and Solid Waste Management Act. A Directive was also issued by the NJDEPE on May 8, 1990, requiring, among other things, that White Chemical pay $241,133.15 to the NJDEPE to fund the cost of stabilizing 9,063 drums on the Site.

9. According to the NJDEPE, White Chemical failed to comply with the NJDEPE enforcement documents. Consequently, in May, 1990, NJDEPE initiated a publicly funded cleanup pursuant to the Spill Act which resulted in the removal of the approximately 1000 drums from the Site. The contents of the drums were sampled and analyzed prior to removal. Lab analysis indicated the following CERCLA hazardous substances: toluene, xylene, acetone, ethylene dichloride and trichlorethylene (TCE). On August 24, 1990, NJPEPE requested that EPA undertake a removal action at the Site under CERCLA.

10. On September 7, 1990, in response to NJDEPE's request, EPA performed a preliminary assessment of the facility and found numerous air and water reactive substances in 55 gallon drums and containers. EPA estimated that 10,900 55-gallon drums were at the Site, precariously stacked and improperly stored. EPA found drums and other containers in various stages of deterioration, fuming, and leaking their contents onto the soil, where stains were observed. During this assessment, EPA overpacked 11 fuming drums and secured them for future handling.

11. On September 28, 1990 the Agency for Toxic Substances and Disease Registry ("ATSDR") issued a health consultation that concluded that the Site posed an imminent and substantial health and safety threat to workers and nearby residents. A Public Health Advisory was later issued in November 1990.

12. To implement the removal action, EPA requested but was denied access from White Chemical, which continued to carry on

business activities at the Site. Accordingly, EPA issued a unilateral administrative order (II CERCLA-00117) which required White Chemical and James White to provide access, halt business operations, and evacuate all personnel from the Site. The administrative order was not complied with until a bankruptcy judge upheld the order, pending a hearing on the matter in federal district court. EPA sought enforcement of the order against defendants White Chemical, James White and AZS in federal district court. On October 23, 1990, the court ordered that pending final determination of the court action, EPA had exclusive access to conduct its response activities and defendants were restrained from initiating or resuming business operations on the Site, or entering upon the Site.

13. After gaining access, EPA began a removal action for surface contamination in October, 1990, which has continued to date. As a result of the ongoing removal action, 4,200 drums containing Waste Material were emptied and shipped off the Site and approximately 6,700 drums containing Waste Material remain staged on the Site, awaiting future removal. Other containers containing Waste Material which are staged on Site include approximately 126 storage tanks, 150 gas cylinders, vats, process reactors, carboys, boxes, and several thousand laboratory-type containers. EPA is presently maintaining 24-hour security at the Site and is continuing to perform on-going response activities, including drum overpacking on an emergency basis, segregating incompatible substances, and further assessing the nature of the chemicals present.

14. During the winter of 1991, EPA conducted a focused feasiblity study ("FFS") which identified alternative remedies for surface contamination at the Site. Pursuant to Section 117 of CERCLA, the FFS and a proposed remedial action plan ("PRAP") for the Site were released to the public for comment on June 21, 1991. These two documents were made available to the public in both the administrative record at EPA's Region II office and the information repository maintained at Newark Public Library. A notice of availability of the FFS and the proposed plan was published in the Newark Star Ledger on June 21, 1991. A public comment period for the PRAP was held from June 21, 1991 to August 21, 1991. A public meeting was held on July 11, 1991 to present the findings of the FFS and the PRAP and to solicit public comment.

15. On June 21, 1991, EPA gave notice of EPA's response activities and a copy of the PRAP to each of the following Respondents: AZS Corporation, White Chemical Corporation, James White, PPG Industries, Inc., D & O Chemicals, Inc., Hexagon Enterprises, Inc., Hummel Croton, Inc., Monsanto Company, Inc., Rhone-Poulenc, Ag. Co., Inc., Maybrook, Inc., and Inolex Chemical Company, Inc.

16. On September 25, 1991, the Site was included on the National Priorities List ("NPL") of Superfund sites. The NPL, codified at 40 C.F.R. Part 300, Appendix B, has been promulgated pursuant to Section 105(a)(8)(B) of CERCLA, 42 U.S.C. §9605(a)(B).

17. On September 26, 1991, EPA issued a Record of Decision (ROD) which stated EPA's selection of a Remedy which is a continuation of the removal action, and includes the on-site pretreatment or neutralization of contaminated material and removal of drums containing hazardous substances from the Site. The estimated cost of the remedy is $22,096,000.00. Completion of EPA's Remedy is expected by Fall of 1992. The ROD is attached to this Order as Attachment II and is incorporated by reference as if fully set forth herein. The ROD is supported by an administrative record that contains the documents and information upon which EPA based its selection of the Remedy.

18. EPA's sample and analysis of drums at the Site indicates, among other things, the presence of CERCLA hazardous substances, including but not limited to the following: bromine, xylene, toluene, acetone, tetrachloroethane, ethylene dichloride, phosphorous acid, phosphoric acid, hydrochloric acid, propionic acid, bromide, capryloyl chloride, capricoyl chloride, myristoyl chloride, pivaloyl chloride, propionyl chloride, bromoacetic acid, acetic acid, and hydriodic acid.

19. Non-carcinogenic and carcinogenic adverse health effects have been associated with many of the contaminants identified on the Site. Mixtures of incompatible substances or improper storage could lead to fire, explosion or release of vapors involving large quantities of flammable and toxic organic and inorganic chemicals. Many of the substances will react upon contact with moisture or air, forming toxic and irritating substances and fumes. The primary pathway for any potential exposure would be through an air release, which poses an imminent and substantial threat to human health and the environment. Exposed or potentially exposed populations include nearby residents, workers, trespassers, fire-fighting personnel and railway commuters.

20. Respondent AZS has been the owner of the property on which the Site is located since August 1975. AZS is a Georgia corporation, located in Atlanta, Georgia.

21. Respondent White Chemical operated the White Chemical facility at the time that hazardous substances were disposed of at the facility. White Chemical manufactured and disposed of hazardous substances on the Site pursuant to formulation agreements with each of the Respondents, identified in paragraphs 22 through 29 below.

22. Respondent James White operated the White Chemical facility at the time that hazardous substances were disposed of at the facility. In addition, James White arranged for disposal of hazardous substances on the Site. James White actually knew about, had immediate supervision over, and was directly responsible for arranging the disposal of hazardous substances on the Site.

23. Respondent PPG Industries, Inc. ("PPG") arranged for White Chemical to formulate a final product, decabromodiphenyl oxide, from materials containing hazardous substances supplied by PPG during the years 1982 through 1984. Pursuant to this arrangement, PPG retained ownership of all the materials and final product containing hazardous substances it provided during the entire time they were in White Chemical's possession. Hazardous substances which were generated from the formulation of decabromodiphenyl oxide and disposed of on the Site included ethylene dichloride, tetrachloroethane and bromine.

24. Respondent D & O Chemicals, Inc. ("D & O") arranged for White Chemical to formulate final products, bromoacetic acid, decabromodiphenyl oxide and hydriodic acid, from materials containing hazardous substances supplied by D & O during the years 1986 through 1991. Pursuant to these arrangements, D & O retained ownership of all the materials and final products containing hazardous substances it provided during the entire time they were in White Chemical's possession. Hazardous substances which were generated by the formulation of the above products and disposed of on the Site included bromine, monobromoacetic acid, dibromoactetic acid, tribromoacetic acid, acetic acid, ethylene dichloride, tetrachloroethane, hydriodic acid, phosphorous acid and phosphoric acid.

25. Respondent Hexagon Enterprise, Inc. ("Hexagon") arranged for White Chemical to formulate a final product, propionyl chloride, from material containing a hazardous substance supplied by Hexagon during 1989. Pursuant to this arrangement, Hexagon retained ownership of all the material and final product containing a hazardous substance it provided during the entire time they were in White Chemical's possession. Hazardous substances which were generated by the formulation of propionyl chloride and disposed of on the Site included propionic acid, propionyl chloride, hydrochloric acid, phosphorous acid and phosphoric acid.

26. Respondent Hummel Croton, Inc. ("Hummel") arranged for White Chemical to formulate final products, oxalic acid derivatives which included dipentyl oxalate, dimethyl oxalate, and diethyl oxalate, from materials containing hazardous substances supplied by Hummel during 1988 and 1989. Pursuant to these arrangements, Hummel retained ownership of all material and final products containing hazardous substances it provided during

the entire time they were in White Chemical's possession. Toluene, a hazardous substance, was generated from the formulation of the above products and disposed on the Site.

27. Respondent Monsanto Company, Inc. ("Monsanto") arranged for White Chemical to formulate a final product, capryloyl chloride, from materials containing a hazardous substance during 1983. Pursuant to this arrangement, White Chemical produced a final product for Monsanto by adding a hazardous substance to material which was supplied and owned by Monsanto throughout the process. Hazardous substances which were generated from the formulation of capryloyl chloride and disposed of on the Site included phosphorous acid, phosphoric acid, hydrochloric acid and capryloyl chloride.

28. Respondent Rhone-Poulenc Ag. Co., Inc. ("Rhone-Poulenc") arranged for White Chemical to formulate a final product, capryloyl chloride, from materials containing a hazardous substance during the years 1983 through 1988. Pursuant to this arrangement, White Chemical produced a final product for Rhone-Poulenc by adding a hazardous substance to material which was supplied and owned by Rhone-Poulenc throughout the process. Hazardous substances which were generated from the formulation of capryloyl chloride and were disposed of on the Site included phosphorous acid, phosphoric acid, hydrochloric acid, and capryloyl chloride.

29. Respondent Maybrook, Inc. ("Maybrook"), arranged for White Chemical to formulate a final product, cocoyl chloride, from materials containing a hazardous substance during the years 1983 through 1988. Cocoyl chloride, a trade name, is comprised of, in part, capryloyl chloride, capricoyl chloride, and myristoyl chloride. Pursuant to this arrangement, White Chemical produced a final product for Maybrook by adding a hazardous substance to material which was supplied and owned by Maybrook throughout the process. Hazardous substances which were generated from the formulation of cocoyl chloride and were disposed of on the Site included capryloyl chloride, capricoyl chloride, myristoyl chloride, phosphorous acid, phosphoric acid and hydrochloric acid.

30. Respondent Inolex Chemical Company, Inc. ("Inolex") arranged for White Chemical to formulate a final product, myristoyl chloride, from materials containing a hazardous substance during the years 1981 through 1984. Pursuant to this arrangement, White Chemical produced a final product for Inclex by adding a hazardous substance to material which was supplied and owned by Inolex throughout the process. Hazardous substances which were generated from the formulation of myristoyl chloride and disposed on the Site included myristoyl chloride, phosphorous acid, phosphoric acid and hydrochloric acid.

IV. CONCLUSIONS OF LAW

31. The Site is a "facility" as defined in Section 101(9) of CERCLA, 42 U.S.C. §9601(9).

32. Each Respondent is a "person" as defined in Section 101(21) of CERCLA, 42 U.S.C. §9601(21).

33. Each Respondent is a person who is liable under one or more subsections of Section 107 (a) of CERCLA, 42 U.S.C. §9607(a), for conditions at the Site, and for all response costs incurred by EPA relating to the Site. As such, Respondents are subject to this Order under Section 106(a) of CERCLA, 42 U.S.C. §9606(a).

34. The substances mentioned in Paragraph 18 of this Order are found at the Site and are hazardous substances within the meaning of that term as defined in Section 101(14) of CERCLA, 42 U.S.C. §9601(14).

35. The presence of hazardous substances in drums and tanks at the Site, the observed releases of hazardous substances into the soil and air from leaking, deteriorated and fuming drums and tanks, the potential for further releases of hazardous substances at and from the Site, as described in the FINDINGS, are "releases" as defined in Section 101(22) of CERCLA, 42 U.S.C. §9601(22). Each release of each hazardous substance from the Site is also an "actual . . . release of a hazardous substance from a facility" as that phrase is used in Section 106(a) of CERCLA, 42 U.S.C. §9606(a).

36. The potential for further releases of hazardous substances from drums and tanks at the Site into the soil and air and the potential for further releases of hazardous substances at and from the Site, as described in the FINDINGS, constitutes a " . . . threatened release of a hazardous substance from a facility" as that phrase is used in Section 106(a) of CERCLA, 42 U.S.C. §9606(a).

37. The release or threatened release of hazardous substances at the Site poses a threat to public health, safety and the environment.

38. The contamination and endangerment at this Site constitute an indivisible injury. The actions required by this Order are necessary to protect the public health, welfare and the environment.

V. DETERMINATIONS

39. Based on the FINDINGS set forth above, EPA has determined that the release and threatened release of hazardous

substances into the environment at and from the Site may present an imminent and substantial endangerment to the public health or welfare or the environment within the meaning of Section 106(a) of CERCLA, 42 U.S.C. §9606(a).

40. A response action of the type contemplated by the National Oil and Hazardous Substances Pollution Contingency Plan in 42 C.F.R. Part 300 ("NCP"), is required at the Site to prevent and/or mitigate any actual and/or potential threat of harm to human health or welfare or the environment caused by the release and threatened release of hazardous substances from the Site.

41. The response activities described in and which are the subject of the ROD are cost effective, are consistent with achieving a permanent Remedy at the Site and are consistent with all other requirements of Section 121 of CERCLA, 42 U.S.C. §9621.

VI. ORDER

42. Based on the foregoing FINDINGS, CONCLUSIONS and DETERMINATIONS, Respondents are hereby ordered to comply with the following provisions, including but not limited to, all attachments to this Order, all documents incorporated by reference into this Order, and all schedules and deadlines in this Order, attached to this Order, or incorporated by reference into this Order.

VII. NOTICE OF INTENT TO COMPLY

43. Respondents shall provide, not later than five (5) days after the effective date of this Order, written notice to EPA's Emergency and Remedial Response Division Director, with copies to the Remedial Project Manager, the On-Scene Coordinator ("OSC") and Assistant Regional Counsel for the Site at the address specified in Section XV, Subsection D, stating whether Respondents will comply with the terms of this Order. If Respondents do not unequivocally commit to perform the Work as provided by this Order, they shall be deemed to have violated this Order and to have failed or refused to comply with this Order. If applicable. Respondents' written notice shall describe, using facts that exist on or prior to the effective date of this Order, any "sufficient cause" defenses asserted by Respondents under Sections 106(b) and 107(c)(3) of CERCLA. The absence of a response by EPA to the notice required by this Paragraph shall not be deemed to be acceptance of Respondents' assertions.

VIII. PARTIES BOUND

44. This Order shall apply to and be binding upon the Respondents, their principals, officers, employees, agents, directors, subsidiaries, assigns and successors. Respondents are responsible for completing the Work and all applicable requirements of this Order. No change in the ownership, corporate status, or other control of the Respondents shall alter any of the Respondents' responsibilities under this Order.

45. Respondents shall provide a copy of this Order to any prospective owners or successors before a controlling interest in Respondents' assets, property rights, or stock are transferred to the prospective owner or successor. Respondents shall provide a copy of this Order to each contractor, subcontractor, laboratory, or consultant retained to perform any Work under this Order, within five days after the effective date of this Order or on the date such services are retained, whichever date occurs later. Respondents shall also provide a copy of this Order to each person representing Respondents with respect to the Site or the Work and shall condition all contracts and subcontracts entered into hereunder upon performance of the Work in conformity with the terms of this Order. With regard to the activities undertaken pursuant to this Order, each contractor and subcontractor shall be deemed to be related by contract to the Respondents within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C. §9607(b)(3). Notwithstanding the terms of any contract, Respondents are responsible for compliance with this Order and for ensuring that its contractors, subcontractors and agents comply with this Order, and perform any Work in accordance with this Order.

46. Within five (5) days after the effective date of this Order, Respondents who own any real property at the Site shall record a copy or copies of this Order in the appropriate governmental office where land ownership and transfer records are filed or recorded and shall ensure that the recording of this Order is indexed to the titles of each and every real property owned by Respondents at the Site so as to provide notice to the third parties of the issuance and terms of this Order with respect to those properties. Respondents shall, within fifteen (15) days after the effective date of this Order, send notice of such recording and indexing to EPA.

47. Not later than sixty (60) days prior to any transfer of any of Respondents real property interests in any property included within the Site, Respondents shall submit a true and correct copy of the transfer document(s) to EPA, and shall identify the transferee by name, principal business address and effective date of the transfer.

IX. EPA REMEDIAL PROJECT MANAGER AND RESPONDENTS' PROJECT COORDINATOR

A. EPA Remedial Project Manager

48. EPA has designated a Remedial Project Manager ("RPM") to monitor the progress of the Work and to coordinate communication between EPA and the Respondents. EPA has also designated an OSC to monitor the day to day Work to be performed by the Respondents pursuant to this Order.

49. EPA's RPM and OSC shall have the authority set forth in 40 C.F.R. §300.120. The RPM and OSC shall have the authority to require a cessation of the performance of any activity at the Site that, in the their opinion, may present or contribute to an endangerment of public health, welfare, or the environment or may cause or threaten to cause the release of hazardous substances from the Site. If the RPM and OSC suspends any activity at the Site, EPA may extend the compliance schedule of this Order, as appropriate. EPA shall notify the Respondents in writing of any extension of time. In addition, the RPM and OSC shall have the authority to take any necessary response action.

50. The RPM and OSC may authorize field modifications to the studies, designs, techniques, or procedures undertaken or utilized in performing the Work required under this Order, provided that any such modifications are consistent with the ROD and the SOW attached to this Order. All such modifications must be approved in writing and signed by the RPM and OSC. Field modifications within the scope of the SOW do not require the submission and approval of work plans and are not to be classified as additional response activities.

51. EPA has the unreviewable right to change its RPM and OSC. If EPA changes its RPM or OSC, EPA will inform Respondents in writing of the name, address, and telephone number of the new RPM or OSC.

52. EPA's RPM and OSC may assign other representatives, including but not limited to, other EPA employees, contractors and subcontractors, to serve as his or her representative for oversight of performance of daily operations during implementation of the Work.

53. The absence of EPA's RPM and OSC from the Site shall not delay or stop any portion of the Work.

B. Identification of Project Coordinator

54. All aspects of the Work to be performed by Respondents pursuant to this Order shall be under the direction and

supervision of a qualified Project Coordinator, described in Section C.2 of the Statement of Work ("SOW"), the selection of whom shall be subject to written approval by EPA. Within fourteen (14) days of the effective date of this Order, Respondents shall designate a Project Coordinator and shall provide EPA in writing with the name, address, phone number and qualifications of the Project Coordinator and alternate Project Coordinator, including primary support entities and staff, proposed to be used in carrying out Work under this Order. The Project Coordinator shall be responsible for the day-to-day management of all the Work to be performed pursuant to this Order. The Project Coordinator shall not be an attorney engaged in the practice of law. The Project Coordinator shall have adequate technical and managerial experience to manage all Work under this Order, including all activities relating to the Site. The Project Coordinator shall be knowledgeable at all times about all matters relating to the Work being performed under this Order. The Project Coordinator shall be the primary contact for EPA on all matters relating to the Work at the Site. A Project Coordinator must be available to communicate with EPA during all days until this Order is terminated. A Project Coordinator must be retained by the Respondents at all times until this Order is terminated.

55. Notice by EPA to the Project Coordinator shall be deemed notice to the Respondents for all matters relating to the Work under this Order.

56. If at any time Respondents propose to use a different Project Coordinator, Respondents shall provide written notice of the proposed change to EPA at least fifteen (15) days prior to such proposed change and shall obtain written approval from EPA before the new Project Coordinator assumes any responsibilities under this Order.

57. EPA will review Respondents' selection of a Project Coordinator according to the terms of this Paragraph and Section XV of this Order. If EPA disapproves the selection of the Project Coordinator, Respondents shall submit to EPA within fourteen (14) days after receipt of EPA's disapproval of the Project Coordinator previously selected, a list of Project Coordinators, including primary support entities and staff, that would be acceptable to Respondents. EPA will thereafter provide written notice to Respondents of the names of the Project Coordinators that are acceptable to EPA. Respondents may then select any approved Project Coordinators from that list and shall notify EPA of the name of the Project Coordinator selected within ten (10) days of EPA's designation of approved Project Coordinators.

X. WORK TO BE PERFORMED

58. The Work to be performed under this Order shall include, but not be limited to, the Remedy described in the ROD, and as specified by the SOW (Attachment I to this Order).

59. Respondents shall provide the EPA RPM and OSC at least seven (7) days advance notice of the commencement of any field activity at the Site undertaken pursuant to the terms of this Order.

60. Respondents shall cooperate with EPA in providing information regarding the Work to the public. As requested by EPA, Respondents shall participate in the preparation of such information for distribution to the public, and in public meetings which may be held or sponsored by EPA to explain activities at or relating to the Site.

A. Response Action

61. Work plans, or other plans, shall be submitted for the Response Action as required in the SOW.

62. Upon approval by EPA, the plans described in Paragraph 61 shall be incorporated into this Order as a requirement of this Order and shall be an enforceable part of this Order.

63. Upon approval by EPA of the plans described in Paragraph 61, Respondents shall implement the Work in accordance with applicable schedules.

64. If Respondents seek to retain a construction contractor to assist in the performance of the Response Action, then Respondents shall submit a copy of the contractor solicitation documents to EPA not later than five (5) days after publishing the solicitation documents.

65. The Work performed by Respondents pursuant to this Order shall, at a minimum, achieve the Performance Standards specified in the ROD and in the SOW.

66. Notwithstanding any action by EPA, Respondents remain fully responsible for achievement of the Performance Standards in the ROD and SOW. Nothing in this Order, or in EPA's approval of the SOW, or in any work plan or other submission, shall be deemed to constitute a warranty or representation of any kind by EPA that full performance of the Response Action will achieve the Performance Standards set forth in the ROD and in the SOW. Respondents' compliance with such approved documents does not foreclose EPA from seeking additional response actions to achieve the applicable Performance Standards.

B. Certification of Completion of Response Action

67. Within thirty (30) calendar days after the completion of the Response Action, Respondents shall submit to EPA and the NJDEPE a Notice of Completion and the Final Report for the Response Action, as required in Section D. 6.a. of the SOW.

68. After EPA determines that all response activities required by this Order have been fully completed by Respondents, EPA will so certify in writing.

C. Certification of Completion of Work

69. Within thirty (30) days of completion of all Work required by this Order, Respondents shall submit to EPA a written report prepared and signed by a State licensed Professional Engineer. This report shall certify that the Work has been completed in accordance with the standards and specifications set forth in this Order, the ROD, the Final Design Report required by the SOW, the SOW and any additional reports which may relate to this Order.

70. EPA will determine whether the Work or any portion thereof has been completed in accordance with the standards and specifications set forth in this Order, the ROD, the Final Design Report required by the SOW, the SOW and any additional reports which may relate to this Order. If not, EPA shall notify Respondents in writing of those tasks which must be performed to complete the Work. Respondents shall then implement the specified activities and tasks in accordance with the specifications and schedules established by EPA.

71. After EPA determines that the Work required by this Order has been fully completed by Respondents, EPA will so certify in writing. This certification shall constitute the Certification of Completion of the Work for purposes of this Order.

72. No portion of any Work performed pursuant to this Order shall be deemed completed until it has been reviewed by EPA and EPA has certified in writing that it has been completed.

XI. ADDITIONAL RESPONSE ACTIVITIES

73. EPA may determine that in addition to the Work identified in this Order and attachments to this Order, additional response activities may be necessary to protect human health and the environment. If EPA determines that additional response activities are necessary, EPA may require Respondents to submit a work plan for additional response activities. EPA may also require Respondents to modify any plan, design, or other

deliverable required by this Order, including any approved modifications.

74. Not later than thirty (30) days after receiving EPA's notice that additional response activities are required pursuant to this Section, Respondents shall submit a work plan for the response activities to EPA for review and approval. Upon written approval by EPA, the work plan is incorporated into this Order as a requirement of this Order and shall be an enforceable part of this Order. Upon approval of the work plan by EPA, Respondents shall implement the work plan according to the standards, specifications, and schedule in the approved work plan. Respondents shall notify EPA of its intent to perform such additional response activities within seven (7) days after receipt of EPA's request for additional response activities.

75. Any additional response activities that Respondents determine are necessary to protect human health and the environment shall be subject to written approval by EPA. If such additional response activities are authorized by EPA, then Respondents shall complete such response activities in accordance with plans, specifications, and schedules approved by EPA pursuant to this Order.

XII. FAILURE TO ATTAIN PERFORMANCE STANDARDS

76. In the event that EPA determines that additional response activities are necessary to meet applicable Performance Standards for the Remedy, EPA may notify Respondents that additional response activities are necessary.

77. Unless otherwise stated by EPA, within thirty (30) days of receipt of notice from EPA that additional response activities are necessary to meet any applicable Performance Standards for the Remedy, Respondents shall submit for approval by EPA a work plan for the additional response activities. The plan shall conform to the applicable requirements of this Order. Upon EPA's approval, the work plan is incorporated into this Order as a requirement of this Order and shall be an enforceable part of this Order. Upon EPA's approval of the plan pursuant to Section XV, Respondents shall implement the plan for additional response activities in accordance with the provisions and schedule contained therein.

78. Any additional response activities that Respondents determine are necessary to meet applicable Performance Standards for the Remedy, or to carry out the Remedy selected in the ROD, shall be subject to written approval by EPA. If such additional response activities are authorized by EPA, then Respondents shall complete such response activities in accordance with plans,

specifications, and schedules approved by EPA pursuant to this Order.

XIII. EPA PERIODIC REVIEW

79. Under Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), and any applicable regulations, EPA may review the remedial action for the Site to assure that the Work performed pursuant to this Order adequately protects human health and the environment. Until such time as EPA certifies completion of the Work, Respondents shall conduct the requisite studies, investigations, or other response actions as determined necessary by EPA in order to permit EPA to conduct the review under Section 121(c) of CERCLA. As a result of any review performed under this Paragraph, Respondents may be required to perform additional response activities, or to modify Work previously performed.

XIV. ENDANGERMENT AND EMERGENCY RESPONSE

80. In the event of any action or occurrence during the performance of the Work which causes or threatens to cause a release of a hazardous substance or which may present an immediate threat to public health or welfare or the environment, Respondents shall immediately take all appropriate action to prevent, abate or minimize the threat, and shall immediately notify EPA's RPM and OSC. In the event of the RPM's unavailability, the Respondents shall notify the EPA Response and Prevention Branch in Edison, New Jersey, at (908) 548-8730. Respondents shall take such action in consultation with EPA's RPM and in accordance with all applicable provisions of this Order, including but not limited to the Health and Safety Plan.

81. Nothing in the preceding Paragraph or elsewhere in this Order shall be deemed to limit any authority of the United States to take, direct or order all appropriate action to protect human health and the environment or to prevent, abate or minimize an actual or threatened release of hazardous substances on, at or from the Site.

XV. EPA REVIEW OF SUBMISSIONS AND REPORTING REQUIREMENTS

A. Plans, Reports & Other Submissions Requiring EPA Approval

82. After review of any deliverable, plan, report or other item which is required to be submitted for review and approval pursuant to this Order, EPA may: (a) approve the submission; (b) approve the submission with modifications; (c) disapprove the submission and direct Respondents to re-submit the document after incorporating EPA's comments; or (d) disapprove the submission

and assume responsibility for performing all or any part of the response action.

83. If EPA approves any plan, report or other submission required by this Order, EPA will so inform the Respondents in writing. Any approval by EPA of any plans, reports or other submissions which are not in writing shall not be effective or binding upon EPA.

84. In the event of approval or approval with modifications by EPA, Respondents shall proceed to take any action required by the plan, report or other item, as approved or modified by EPA, within 14 days of such approval or modification.

85. If EPA disapproves any plan, report or other item required to be submitted to EPA for approval pursuant to this Order, other than Progress Reports discussed in subsection B below, Respondents shall have fourteen (14) days from the receipt of notice of such disapproval to correct any deficiencies and submit a revised plan, report or other item for approval, unless another period of time is specified in the notice. Respondents must incorporate each of EPA's comments and submit a revised plan, report or other item which incorporates the changes required by EPA, within the time period set forth above.

86. In the event that any comment on any report required pursuant to this Order is not incorporated, to EPA's satisfaction, by Respondents in the subsequent submittal, Respondents shall be deemed in violation of this Order. In the event that a subsequent submittal or portion thereof is disapproved, EPA retains the right to amend or modify the submittal. Respondents shall implement any such submittal as amended or developed by EPA. Notwithstanding any notice of disapproval, Respondents shall, to the extent required by EPA, proceed to take all actions required by the nondeficient portions of the submittal.

87. In its sole discretion, EPA may engage in discussions to resolve technical issues raised by EPA's comments made pursuant to the two preceding Paragraphs above. EPA may modify its comments and/or extend the due date for a subsequent submittal as a consequence of such discussions.

B. Progress Reports

88. In addition to other deliverables set forth in this Order, Respondents shall submit to EPA and NJDEPE monthly written progress reports by the tenth day of each month following the effective date of this Order. Respondents' obligation to submit progress reports continues until EPA gives Respondents written notice under this Order. For each calendar month, or part

thereof, the monthly progress reports shall include, at least, the following:

a. A description of all actions which have been taken toward achieving compliance with this Order during the prior month;

b. A description of any violations of this Order and other problems encountered during the prior month;

c. A description of all corrective actions taken in response to any violations or problems which occurred during the prior month;

d. The results of all sampling, test results and other data received or generated by Respondents during the course of implementing the Work during the prior month. Such results shall be validated in accordance with the approved Quality Assurance Project Plan developed in conformity with the SOW;

e. A description of all plans, actions and data which are scheduled for the next two months;

f. A quantified estimate of the percentage of the Work required by this Order which has been completed as of the date of the progress report; and

g. An identification of all delays encountered or anticipated that may affect the future schedule for performance of the Work, and all efforts made by Respondents to mitigate delays or anticipated delays.

89. EPA will notify the Respondents in writing, if EPA determines that a progress report is incomplete or deficient. Respondents shall make the necessary revisions and resubmit the revised progress report with the next scheduled progress report or, if the next scheduled progress report is due less than seven (7) days following Respondents' receipt of the notice of deficiency, with the subsequently scheduled progress report.

90. Respondents shall be deemed in violation of this Order if EPA determines that a revised progress report is deficient.

C. Miscellaneous Provisions

91. Respondents may request in writing that EPA approve modifications to EPA-approved reports, schedules, deliverables and other writings required under the terms of this Order at any time during the implementation of the Work required by this Order. Any and all such modifications under this Order must be approved in writing and signed by the Chief of the New Jersey Superfund Branch I, ERRD, EPA-Region II.

a. EPA shall have the sole authority to make any such modifications under this Order.

b. EPA alone shall be the final arbiter of all issues and disputes concerning: i) any reports, schedules, deliverables and other writings required under the terms of this Order which EPA approves or which the Respondents propose under the terms of this Order, and ii) all Work which shall be required or performed under this Order and/or under any reports, schedules, deliverables and other writings required under the terms of this Order which EPA approves pursuant to the terms of this Order.

92. All reports, schedules, deliverables and other writings required under the terms of this Order shall, upon approval by EPA, be deemed incorporated into this Order and may be enforced as any other provision in this Order.

93. No informal advice, guidance, suggestions or comments by EPA or NJDEPE officials shall be construed to relieve Respondents of any of its obligations under this Order.

D. Notifications/Document Submissions

94. All communications, whether written or oral, including any notice required to be given under this Order, from Respondents to EPA shall be directed to EPA's RPM. Respondents shall submit to EPA and NJDEPE copies of all documents, including plans, reports, and other correspondence, which are developed pursuant to this Order, and shall send these documents by certified or express mail to the following addresses:

2 Copies to: Chief, New Jersey Superfund Branch I
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
26 Federal Plaza, Room 711
New York, New York 10278
Attn: White Chemical Corporation Site
Remedial Project Manager

1 Copy to: New Jersey Superfund Branch
Office of Regional Counsel
U.S. Environmental Protection Agency
26 Federal Plaza, Room 309
New York, N.Y. 10278
Attn: White Chemical Corporation Site Attorney

All communication from an attorney must be addressed to EPA's Office of Regional Counsel at the above address.

2 Copies to: New Jersey Department of Environmental
Protection and Energy
Division of Hazardous Waste Management
401 East State Street
5th Floor West Wing, Trenton, New Jersey 08625
Attn: Site Manager-White Chemical Corporation

95. In the event that EPA requests more than the number of copies stated above of any report or other documents required by this Order for itself or the State, Respondents shall provide the number of copies requested.

XVI. QUALITY ASSURANCE, SAMPLING AND DATA ANALYSIS

96. Respondents shall use quality assurance, quality control and chain of custody procedures in the preparation of Quality Assurance Project Plans ("QAPPs") as specified in the SOW. Each QAPP shall be prepared in accordance with the EPA Region II, Quality Assurance Manual and subsequent amendments thereto. Respondents shall submit each QAPP in accordance with the SOW, the NCP and these guidelines. EPA, after review of each QAPP, will notify the Respondents of any required modifications, conditions precedent to approval, disapproval or approval of the QAPP. Upon receipt of notification of disapproval, conditions precedent to approval or any need for modifications, Respondents shall make all required modifications to the QAPP. Respondents shall provide, in all contract documents with laboratories utilized by Respondents to implement this Order, that EPA be allowed access to any laboratory utilized by Respondents in implementing this Order. In addition, Respondents shall, as requested by EPA, have a designated laboratory analyze samples submitted by EPA for quality assurance purposes.

97. At the request of EPA, Respondents shall allow split or duplicate samples to be taken by EPA and/or its authorized representatives, and/or the State, of any samples collected by Respondents pursuant to the implementation of this Order. Respondents shall notify EPA not less than fourteen (14) days in advance of any sample collection activity. In addition, EPA shall have the right to take any additional samples from the Site that EPA shall deem necessary.

XVII. COMPLIANCE WITH APPLICABLE LAWS

98. All Work conducted pursuant to this Order shall be performed in accordance with prevailing professional standards.

99. All activities carried out by Respondents pursuant to this Order shall be done in accordance with all applicable federal, state and local laws, regulations, ordinances and other requirements. EPA has determined that the activities contemplated by this Order are consistent with the NCP.

100. All activities conducted by Respondents pursuant to this Order shall comply with the requirements of CERCLA, the NCP, and all applicable Occupational Safety and Health Administration ("OSHA") regulations for worker health and safety as found in 29 C.F.R. §1910 et seq., and elsewhere.

101. Except as provided in Section 121(e) of CERCLA and the NCP, no permit shall be required for any portion of the Work conducted entirely on-Site. For any portion of the Work performed on-Site which would, but for Section 121(e) of CERCLA, require a federal, state or local permit or approval, Respondents shall submit unsigned timely applications and take all other actions necessary to comply with all such permits or approvals.

102. This Order is not, and shall not be construed to be, a permit issued pursuant to any federal or state statute or regulation.

103. All off-Site transportation, treatment, storage or disposal of Waste Materials removed from the Site by Respondents shall be in compliance with Section 121(d)(3) of CERCLA, 42 U.S.C. §9621(d)(3). Respondents shall be responsible for compliance with all applicable requirements relating to off-Site waste management under the Resource Conservation and Recovery Act of 1976 ("RCRA"), 42 U.S.C. §6901 et seq. and the New Jersey Solid Waste Management Act, N.J.S.A. §13:1E-1 et seq., including the standards for generators and transporters of hazardous waste promulgated under 40 C.F.R. Parts 262 and 263. Respondents shall also use and sign manifest forms for all hazardous wastes transported from the Site. Respondents shall also designate all destination facilities that they propose to use for such off-Site transfer, storage, treatment or disposal in the Site Management Plan for Remedial Action which is required by the SOW. Respondents shall conduct off-Site disposal activities in conformity with the NCP and any amendments thereto, and the Revised Procedures for Planning and Implementing Off-Site Response Actions, EPA Office of Solid Waste and Emergency Response, OSWER Directive 9834.11, November 13, 1987, and any amendments thereto.

104. All disposal of Waste Material conducted by or for the Respondents pursuant to performing any of the Work under this Order shall comply with all provisions of the Toxic Substances Control Act ("TSCA"), 15 U.S.C. §2601 et seq., all regulations

promulgated pursuant to both RCRA and TSCA, and all applicable federal, state and local laws and regulations.

XVIII. ACCESS TO SITE NOT OWNED BY RESPONDENTS

105. If the site, the off-Site area that is to be used for access, properties where documents required to be prepared or maintained by this Order are located, or other property subject to or affected by the Order, is owned in whole or in part by parties other than those bcund by this Order, Respondents will obtain, or use their best efforts to obtain, site access agreements from the present owner(s) within 45 days of the effective date of this Order. Respondents' best efforts shall include providing reasonable compensation to any present property owner. Such agreements shall provide access for EPA, its contractors and oversight officials, the State and its contractors, and Respondents or Respondents' authorized representatives and contractors, and such agreements shall specify that Respondents are not EPA's representatives with respect to liability associated with Site activities. Copies of such agreements shall be provided to EPA prior to Respondents' initiation of field activities. If access agreements are not obtained within the time referenced above, Respondents shall immediately notify EPA of its failure to obtain access. Subject to the United States' unreviewable discretion, EPA may use its legal authorities to obtain access for the Respondents, may perform those response actions with EPA contractors at the property in question, or may terminate the Order, if Respondents cannot obtain access agreements. If EPA performs those tasks or activities with contractors and does not terminate the Order, Respondents shall perform all other activities not requiring access to that property. Respondents shall integrate the results of any such tasks undertaken by EPA into its reports and deliverables.

XIX. SITE ACCESS AND DATA/DOCUMENT AVAILABILITY

A. Site Access

106. All Respondents shall have their obligations under this Section begin upon the effective date of this Order and continue until EPA certifies Completion of the Work pursuant to Section X of this Order. During this period, the United States and its representatives, including EPA and its contractors, and the State and its representatives, including NJDEPE and its contractors, shall have unimpeded access at all times to the Site, any property where access is required for the implementation of this Order, and the location of any documents which are required to be prepared or maintained by this Order.

This access shall be for the purpose of conducting any activity authorized by or related to this Order, including, but not limited to:

1. Monitoring the Work or any other activities taking place at or near the Site;

2. Verifying any data or information submitted to the United States;

3. Conducting investigations relating to contamination at or near the Site;

4. Obtaining samples;

5. Assessing the need for or planning and implementing additional response actions at or near the Site; and

6. Inspecting and copying records, operating logs, contracts or other documents, which are not subject to an attorney-client privilege or any other privilege recognized by federal law, which are generated by Respondents or their agents.

107. Respondents shall not interfere in any manner with any attempt by EPA or its representatives to enter or move about the Site for any purpose at any time. Upon the request of any EPA representative, the Respondents will facilitate and assist EPA representatives to enter and move about the Site and any property on which Work is being performed under this Order.

B. Access to Information

108. The Respondents shall, upon request by EPA, provide EPA access to and/or copies of all records and information within the possession or control of the Respondents or its contractors or agents which relate in any manner to the Site or to the Work required under this Order. This includes, but is not limited to, all data, analyses, chain of custody records, manifests, trucking logs, contractor names, correspondence, technical information of any type, waste screening or analyses, names of all off-Site facilities used for treatment, storage, or disposal of Waste Materials removed from the Site, permits, insurance documents, health and safety procedures and status reports. If EPA, at its option, elects to review any records relating to the Site, it shall give the Respondents prior notice. The Respondents shall thereafter make all records requested by EPA available for EPA review at a location in the State on any days specified by EPA.

109. Respondents shall make available to EPA for purposes of investigation, information gathering, or testimony, its employees, agents or representatives with knowledge of relevant facts concerning the performance of Work.

110. Notwithstanding any other provision of this Order, the United States retains all its access and inspection authorities and rights under CERCLA, RCRA, and any other applicable statutes or regulations.

C. Confidentiality Claim

111. Respondents may assert a claim of business confidentiality covering part or all of the information submitted to EPA pursuant to the terms of this Order under 40 C.F.R. §2.203, provided such claim is not inconsistent with Section 104(e)(7) of CERCLA, 42 U.S.C. §9604(e)(7), or other provisions of law. This claim shall be asserted in the manner described by 40 C.F.R. §2.203(b) and substantiated by Respondents at the time the claim is made. Information determined to be confidential by EPA will be given the protection specified in 40 C.F.R. Part 2. If no such claim accompanies the information when it is submitted to EPA, it may be made available to the public by EPA or the State, without further notice to the Respondents. Respondents shall not assert confidentiality claims with respect to any data, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical or engineering data, or any other documents or information evidencing conditions at or around the Site.

112. Respondents shall maintain for the period during which this Order is in effect, an index of documents that Respondents claim contain confidential business information. The index shall contain, for each document, the date, author, addressee and subject of the document. Upon written request from EPA, Respondents shall submit a copy of the index to EPA.

XX. RECORDS, DOCUMENTS AND INFORMATION PRESERVISION

113. At all times from the effective date of this Order to ten (10) years after EPA provides notice of Completion of Work pursuant to Section X of this Order, the Respondents shall allow EPA to have access to, and, upon request of EPA, shall provide EPA with copies of all records, documents, and information relating to this Site and the Work done or being done or to be done pursuant to this Order.

114. From the effective date of this Order until ten (10) years after EPA provides notice of Completion of Work pursuant to Section X of this Order, Respondents shall retain, or shall

arrange for a document custodian acceptable to EPA to retain all records, documents and information which come into its possession or control during the effective term of this Order, which relate to the Order and the performance of Work under this Order. Without the prior written consent of EPA, Respondents shall not destroy or dispose of any of these records, documents and information at any time prior to ten (10) years after EPA provides notice of Completion of Work pursuant Section X of this Order. Respondents shall also instruct its contractors, agents, and employees to preserve all documents, records, and information of whatever kind, nature or description relating to the performance of the Work.

115. Within ninety (90) days after the effective date of this Order, Respondents shall inform EPA, in writing, as to the name, address, and phone number of the person who will act as custodian for these records, documents and information. After the ten (10) year period for document retention expires, Respondents shall notify EPA, in writing, at least ninety (90) days prior to any proposed destruction or disposal of any such records, documents and information. If the United States objects or denies permission for document destruction, the Respondents shall relinquish custody of the documents to EPA, and the obligations of the Respondents with respect to such documents shall cease. Upon request, Respondents shall relinquish custody of any of the records to EPA at any time.

116. Within forty-five (45) days after the effective date of this Order, Respondents shall submit a written certification to EPA's RPM that they have not altered, mutilated, discarded, destroyed or otherwise disposed of any records, documents and other information relating to its potential liability with regard to the Site. Respondents shall not dispose of any such documents without prior approval by EPA. Respondents shall, upon EPA's request and at no cost to EPA, deliver the documents or copies of the documents to EPA.

XXI. DELAY IN PERFORMANCE

117. Any delay in performance of this Order that, in EPA's judgment, is not properly justified by Respondents under the terms of this Section, shall be considered a violation of this Order. Any delay in performance of this Order shall not affect Respondents' obligations to perform fully all obligations under the terms and conditions of this Order.

118. Respondents shall notify EPA of any delay or anticipated delay in performing any requirement of this Order. Such notification shall be made verbally to EPA's RPM within twenty-four hours after Respondents first knew or should have

known that circumstances might cause delay or noncompliance with Respondents' performance of a requirement of this Order. Respondents shall adopt all reasonable measures to avoid or minimize any such delay. Within five (5) business days after Respondents first knew or should have known that circumstances might cause delay or noncompliance with Respondents' performance of a requirement of this Order, Respondents shall supply to EPA in writing, the following: (1) an explanation of the cause of any actual or anticipated delay or noncompliance with the obligation; (2) the anticipated or actual duration of such delay or noncompliance; (3) the measures taken and/or to be taken by Respondents to prevent or minimize the delay or correct the noncompliance with the obligation; and (4) the timetable for implementation of such measures. Such notice shall be accompanied by all available documentation, including but not limited to, third party correspondence. Unanticipated or increased costs or expenses associated with implementation of the activities called for in this Order or financial incapacity is not a justification for any delay in performance.

119. Respondents shall use their best efforts to avoid or minimize any delay or prevention of performance of their obligations under this Order.

XXII. ASSURANCE OF ABILITY TO COMPLETE WORK

120. Respondents shall demonstrate their ability to complete the Work and to pay all claims that arise in connection with performance of the Work by obtaining, and presenting to EPA for approval within thirty (30) days of the effective date of this Order, one of the following: (1) a performance bond; (2) an irrevocable letter of credit; (3) a guarantee by a third party; or (4) internal financial information to allow EPA to determine that Respondents have sufficient assets available to perform the Work. Respondents shall demonstrate financial assurance in an amount no less than the estimate of cost for the performance of Work at the Site.

121. If Respondents seek to demonstrate their ability to complete the Work by means of internal financial information, the Respondents shall make such demonstration by providing a formal opinion to EPA by an independent Certified Public Accountant, and Respondents' most recent audited financial statements or financial assurance information provided under RCRA or similar statute. Respondents shall annually (on the anniversary date of the effective date of this Order) submit such information to EPA. If at any time EPA determines that such financial information is inadequate, Respondents shall, within thirty (30) days of receipt of notice of EPA's determination,

obtain and present to EPA for approval one of the other three forms of financial assurance listed in the preceding Paragraph, above.

122. Respondents must obtain written approval from EPA of the adequacy of their financial assurance in order to comply with the provisions of this Section.

123. All contractors and subcontractors that the Respondents plan to use for Work at the Site must have adequate liability coverage or must be indemnified by the Respondents for any and all liability which may result from any activities at and on the Site pursuant to this Order.

XXIII. UNITED STATES NOT LIABLE

124. The United States, by issuance of this Order, shall not be liable for any injuries or damages to any persons or properties resulting from any acts or omissions by the Respondents, and any directors, officers, employees, agents, representatives, successors, assigns, contractors, subcontractors or consultants of the Respondents in carrying out any action or activity related to this Order. The United States shall not be a party to any contract entered into by Respondents or their directors, officers, employees, agents, successors, assigns, contractors, subcontractors, or consultants in carrying out any action or activity related to this Order, and Respondents shall not represent to anyone that the United States is or may be a party to any such contract.

125. Notwithstanding approvals which may be granted by the United States, the State, or other governmental entities, the Respondents shall assume any and all liability arising from or relating to Respondents' acts or omissions or the acts or omissions of any of Respondents' contractors, subcontractors or any other person acting on behalf of Respondents in the performance of the Work, or Respondents' failure to perform properly or completely the requirements of this Order.

126. Respondents shall save and hold harmless the United States and its officials, agents, employees, contractors, subcontractors, or representatives for or from any and all claims or causes of action or other costs incurred by the United States including but not limited to attorneys fees and other expenses of litigation and settlement arising from or on account of acts or omissions of Respondents, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Order, including any claims arising from any

designation of Respondents as EPA's authorized representatives under Section 104(e) of CERCLA.

XXIV. ENFORCEMENT AND RESERVATIONS

127. EPA reserves the right to bring an action against any entity, including the Respondents, under Section 107 of CERCLA, 42 U.S.C. §9607, for recovery of any response costs incurred by the United States relating to this Order and/or for any other response costs which have been incurred or will be incurred by the United States relating to the Site. Such actions may relate to, but shall not be limited to, actions for past costs, direct costs, indirect costs, the costs of oversight, the costs of compiling the cost documentation to support any cost demand, as well as accrued interest as provided in Section 107(a) of CERCLA, 42 U.S.C. §9607(a).

128. Notwithstanding any other provision of this Order, at any time during the response action EPA may perform its own studies, complete the response action (or any portion of the response action) as provided in CERCLA and the NCP, and seek reimbursement from Respondents for EPA's costs, or seek any other appropriate relief.

129. Nothing contained in this Order shall preclude EPA from taking any additional enforcement actions, including modification of this Order, issuance of additional Orders, entry into any Consent Decree, and/or additional remedial or removal actions as EPA may deem necessary, or from requiring Respondents (or any other potentially responsible parties for the Site) in the future to perform additional activities pursuant to CERCLA, 42 U.S.C. §9606(a), et seq., or any other applicable law. Respondents shall be liable under CERCLA Section 107(a), 42 U.S.C. §9607(a), for the costs of any such additional actions.

130. Nothing contained in this Order shall be interpreted as limiting or affecting EPA's information gathering, right of entry and inspection, and enforcement authorities and rights under CERCLA, RCRA and any other applicable statutes or regulations.

131. Any failure by Respondents to comply with any provision in this Order may result in EPA's unilaterally taking or funding the actions required under this Order, pursuant to CERCLA.

132. Any failure by Respondents to comply with any provision in this Order, or any provision or schedule in the SOW pursuant to the terms of this Order, will be considered a violation of this Order.

133. If the Respondents fail to perform any of the actions set forth in this Order, or otherwise violate the terms of this Order, EPA may elect to:

a. Demand that the Respondents cease Work at the Site; and/or

b. Use federal funds to complete the Work required by the Order; and/or

c. Initiate an action against the Respondents under Sections 106(b), 107(a) and/or 107(c) of CERCLA, 42 U.S.C. §§9606(b), 9607(a), and/or 9607(c), respectively; and/or

d. Take any other actions authorized under federal laws or regulations.

134. Respondents shall be subject to civil penalties under Section 106(b) of CERCLA, 42 U.S.C. §9606(b), of not more than $25,000 for each day in which Respondents willfully violate, or fail or refuse to comply with any terms, provisions, or schedules set forth in this Order or established pursuant to this Order for the performance of any activities without sufficient cause. In addition, failure to provide Response Action properly under this Order, or any portion hereof, without sufficient cause, may result in liability under Section 107(c)(3) of CERCLA, 42 U.S.C. §9607(c)(3), for punitive damages in an amount at least equal to, and not more than three times the amount of any costs incurred by federal funds as a result of such failure to take proper action.

135. Nothing contained in this Order shall affect the right of EPA to initiate an action for civil penalties against any entity, including the Respondents, pursuant to Section 106(b) of CERCLA, 42 U.S.C. §9606(b).

136. Nothing contained in this Order shall constitute or be construed as a bar to, a release of, a satisfaction of, or a waiver of any claim or cause of action or demand in law or equity which EPA has at present or which EPA may have in the future against any entity or individual, including the Respondent, for any liability it may have arising out of or relating in any way to the Site.

137. Nothing contained in this Order shall preclude the State or any agency or department thereof, from taking or maintaining any enforcement action or litigation relating to the Site, including issuing any directive pursuant to State law relating to the Site.

138. Nothing contained in this Order shall be construed to mean that the Respondents are the only potentially responsible parties with respect to the release and threatened release of hazardous substances at the Site.

139. Nothing contained in this Order shall affect any right, claim, interest, defense or cause of action of EPA or the Respondents with respect to any entity which is not a party to this Order.

140. Nothing contained in this Order constitutes a decision by EPA on preauthorization or on any approval of funds under Section 111(a)(2) of CERCLA, 42 U.S.C. §9611(a)(2) or 40 C.F.R. §300.700(d), or any amendments thereto.

141. If a court issues an Order that invalidates any provision of this Order or finds that Respondents have sufficient cause not to comply with one or more provisions of this Order, Respondents shall remain bound to comply with all provisions of this Order not invalidated by the court's order.

XXV. ADMINISTRATIVE RECORD

142. Upon request by EPA, Respondents must submit to EPA all documents related to the selection of the response action for possible addition to the Administrative Record file.

XXVI. EFFECTIVE DATE AND COMPUTATION OF TIME

143. This Order shall be effective ten (10) days after the Order is signed by the Regional Administrator or his delegate. All times for performance of ordered activities shall be calculated from this effective date.

144. Respondents shall initiate implementation of the requirements of the SOW on the date that this Order becomes effective.

XXVII. OPPORTUNITY TO CONFER

145. Respondents may, within ten (10) days after they receive this Order, request a conference with EPA to discuss this Order. If requested, the conference shall occur within the above mentioned ten-day period. The conference shall take place at EPA's Region II Office, located at 26 Federal Plaza, New York, New York.

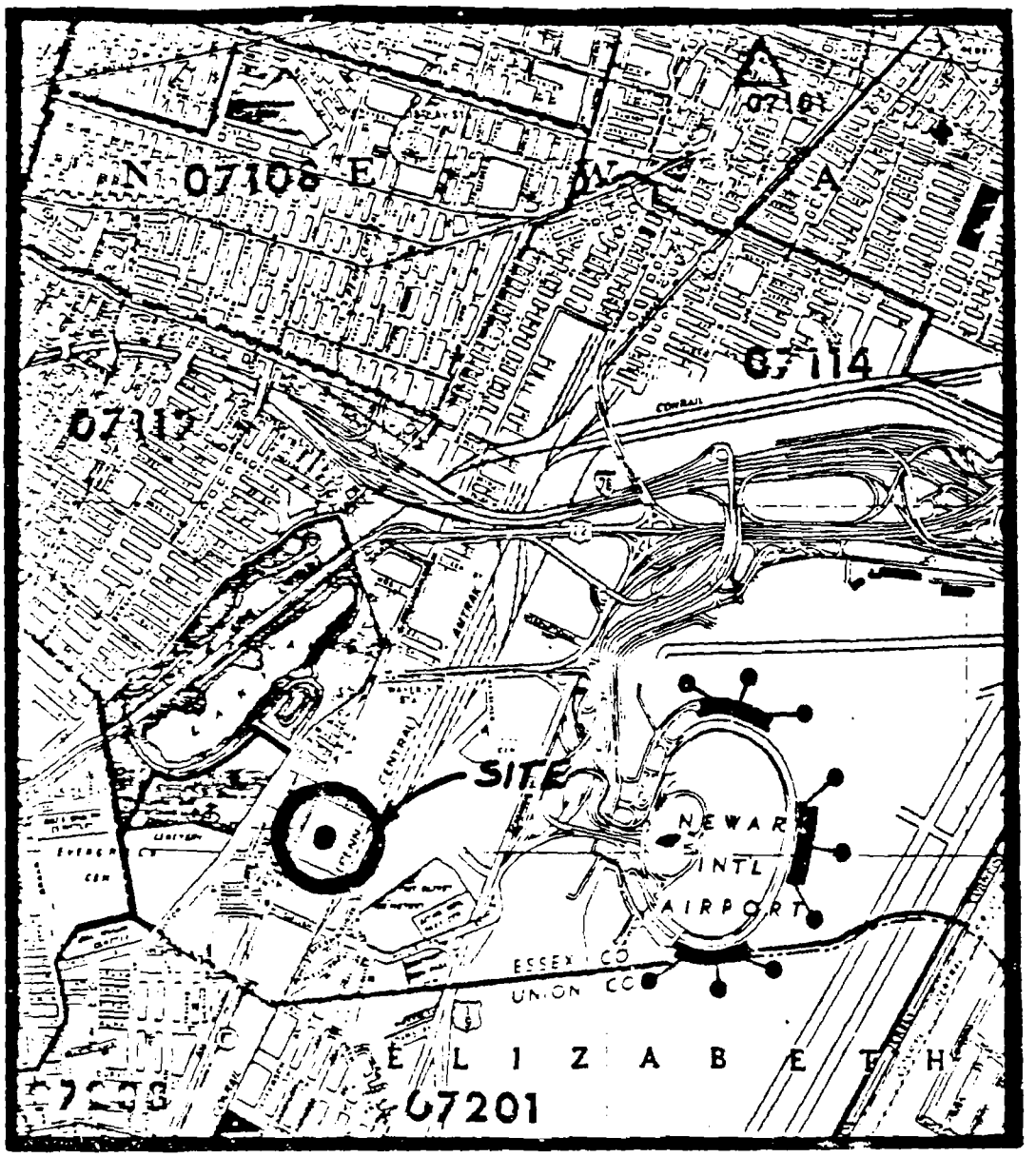
146. The purpose and scope of the conference shall be limited to issues involving the implementation of the response actions required by this Order and the extent to which Respondents intend to comply with this Order. This conference is not an evidentiary hearing, and does not constitute a proceeding to challenge this Order. It does not give Respondents a right to seek review of this Order, or to seek resolution of potential liability, and no official stenographic record of the conference will be made. At any conference held pursuant to Respondents' request, Respondents may appear in person or by an attorney or other representative.

147. Request for a conference must be by telephone followed by written confirmation mailed that day to:

Silvina Fonseca
Remedial Project Manager
New Jersey Superfund Branch I
U.S. Environmental Protection Agency
26 Federal Plaza, Room 711
New York, New York 10278
Telephone: (212) 264-7604

So Ordered, this 31 day of March, 1992.

BY: _____
Constantine Sidamon-Eristoff
Regional Administrator
U.S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, New York 10278



LEGEND

- Main Through Roads
- Highways under Const.
- Proposed Highways
- Other Roads & Streets
- N.J. Turnpike
- Garden State Pkwy
- Highway Symbols
- Railroad Lines and Stations
- Bus Lines
- Parks
- Cemeteries
- Golf Courses
- Airports
- State & Federal Lands
- Hospitals
- State Boundaries
- County Boundaries
- Municipal Boundaries
- Zip Code Boundaries

FIGURE 1

85360

Do Not State This Drawing

ATTACHMENT I

STATEMENT OF WORK

WHITE CHEMICAL CORPORATION SITE

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A. THE WORK TO BE PERFORMED

As described in greater detail below, the Work to be performed under this Order for the White Chemical Corporation Site ("the Site") shall include, but shall not be limited to, the following elements:

1. Response Action shall implement the Selected Remedial Alternative for the surface contamination described in the Record of Decision ("ROD"), signed on September 26, 1991, hereinafter referred to as the "Selected Remedial Alternative". The major components of the Selected Remedial Alternative for surface contamination include:

   a. Appropriate security measures;

   b. Site stabilization;

   c. On-site pretreatment or neutralization of contaminated material;

   d. Off-site treatment, recycling, or disposal of contaminated material;

   e. Decontamination and off-site disposal or recycling of empty drums and small containers;

   f. Decontamination and on-site storage of tanks and process piping; and

   g. Appropriate environmental monitoring to ensure the effectiveness of the remedy.

The United States Environmental Protection Agency ("EPA") will perform all community relations activities related to the Site. The approximate location of the Site is shown in Figure 1.

B. COMMITMENT OF RESPONDENTS

Respondents shall finance and perform the Work in accordance with this Order, including all tasks set forth in this Attachment and all terms, conditions and schedules set forth therein or developed and approved thereunder. The Work shall be performed in a manner consistent with the ROD, which sets forth requirements for the Work. In addition, EPA reserves the right to terminate this Order and to conduct the Work described therein and to seek reimbursement for costs and penalties from the Respondents.

C. PROJECT SUPERVISION/MANAGEMENT

1. SUPERVISORY PROFESSIONAL ENGINEER

The Work, post-remediation monitoring activities, and any other technical activities performed by Respondents pursuant to this Order shall meet any and all requirements of applicable federal, state and local laws and be performed under the direction and supervision of a qualified licensed professional engineer. Prior to the initiation of any such Work, Respondents shall notify EPA, in writing, of the name, title, proposed responsibilities and qualifications of the supervisory professional engineer, and the names of all contractors and subcontractors proposed to be used in the development and implementation of the Work to be performed by those parties. All completed work shall be prepared under the supervision of, and signed by and certified by, a licensed New Jersey professional engineer. Selection of any such engineer, contractor or subcontractor shall be subject to approval by EPA.

2. PROJECT COORDINATOR

The Project Coordinator shall be responsible for the day to day management of all Work to be performed pursuant to this Order. The Project Coordinator shall have adequate technical and managerial experience to manage all Work described in this Statement of Work and under this Order including having knowledge relating to all activities at the Site. The Project Coordinator shall be knowledgeable at all times about all matters relating to activities regarding the Response Action. The Project Coordinator shall be the primary contact for EPA on all matters relating to Work at the Site and should be available for EPA to contact during all working days.

D. RESPONSE ACTION

1. SITE MANAGEMENT PLAN FOR RESPONSE ACTION

a. Within fourteen (14) calendar days of the effective date of this Order, Respondents shall submit to EPA and the New Jersey Department of Environmental Protection and Energy ("NJDEPE"), a Site Management Plan ("SMP") for the Response Action activities (i.e., for the preparation of the Response Action Work Plan required by Section D.2., below, and the Response Action Work).

b. The SMP for Response Action activities shall include, at a minimum, the following items:

(1) Identification of all off-site facilities proposed to be used to manage or dispose of hazardous substances, pollutants, contaminants, or other materials from the Site resulting from the Work. For each facility, the proposed materials and methods of management shall be described (See requirements of Section D. 2. g. below).

(2) Discussion of the methods by which Response operations shall proceed. Discussion shall include the following:

(a) Timing of and manner in which activities shall be sequenced;

(b) Preparation of the Site including security, utilities, decontamination facilities, construction trailers, equipment storage and construction of roadways;

(c) Coordination of response activities;

(d) Site maintenance;

(e) Coordination with local authorities regarding contingency planning and potential traffic obstruction;

(f) Entry and access to the Site during the response period(s) and periods of inactivity, including provisions for decontamination, and fume and vapor control;

(g) Procedures for scheduling and managing submittals, including those of subcontractors, off-site fabricators, suppliers, and purchasing agents; and

(h) Reporting procedures including frequency of reports and report formats.

c. EPA will either approve the SMP for the Response Action, or require modification of it, in accordance with the procedures of this Order.

2. RESPONSE ACTION WORK PLAN

Within fourteen (14) calendar days of the date on which Respondents receive written notification of the approval of the SMP for Response Action activities, Respondents shall submit a detailed Response Action Work Plan to EPA and the State. The detailed Response Action Work Plan shall include, but not be limited to, the following items:

a. Response Action Schedule

The Response Action schedule shall be in the form of a task/subtask activity bar chart or critical path method sequence of events. A detailed description of how these tasks will be accomplished should be included along with the schedule.

b. Personnel Identification

The Response Action Work Plan will also include identification of contractors and subcontractors and their respective responsibilities for performance of Response Action activities. It shall include a list of all individuals expected to participate in the Response Action activities. The responsibilities of each key manager, engineer, architect, scientist or technician shall be provided, as well as a curriculum vitae. A provision shall be included providing the submittal of supplemental information to EPA prior to the involvement of additional key personnel in the Response Action.

c. Site Description Plan

Maps depicting, to the extent known and determined, work and safety zones, including but not limited to: exclusion zones, contaminant reduction zones, container staging and sampling area, waste storage area(s), storage sheds, on-site laboratory, and command post, all located from fixed reference points and plotted scale.

d. Site Security Plan

A plan for providing Site security, including measures to protect the health and safety of the surrounding population.

- check pt
- logs
- [illegible]
- documentation

e. Specifications

Design, construction, operation, and maintenance specifications for all on-site Response Action activities (as required) and identification of all equipment to be utilized during Response Action activities.

f. Storage Plan

A plan for temporary storage of waste as it is staged and prepared for treatment and/or disposal, including:

i. measures to prevent the exposure of the waste to the elements;

ii. construction of a containment system to prevent release, spillage, runoff, and run-on (e.g., dike, berm), if applicable;

iii. measures to prevent the accumulation of liquids from rainfall during pre- and post-removal operations, if applicable; and

iv. measures to prevent, contain, and monitor the emission of hazardous vapors, fumes and/or particulates during operations.

g. Disposal/Treatment Plan

Plans for disposal and/or treatment of all hazardous substances identified at the Site. All hazardous substances leaving the Site must comply with applicable state, federal, and local regulations as well as EPA's Off-site Disposal Policy. In addition, when hazardous substances from the Site are to be shipped to an off-site facility, Respondent shall insure that both the environmental agency of the accepting state, the EPA Remedial Project Manager and the EPA On-Scene Coordinator are notified of the following: (a) the name and location of the facility to which the wastes are to be shipped; (b) the type and quantity of waste to be shipped; (c) the expected schedule for the waste shipments; and (d) the method of transportation. Respondent shall provide such notification to the affected state and to EPA in writing as soon as practicable, but in any event at least five (5) business days prior to the said shipments.

h. Decontamination Plan

Decontamination procedures for expendable and nonexpendable equipment.

i. Sampling, Analysis and Monitoring Plan

i. The Sampling, Analysis and Monitoring Plan ("SAMP") will describe in detail the sampling, analysis and monitoring that must be performed in order to implement the Selected Remedial Alternative. All sampling and monitoring shall be performed in accordance with the "Region II CERCLA Quality Assurance Manual," EPA Region II, dated March, 1988, or an alternative EPA approved test method, and all testing methods and procedures will be fully documented and referenced to established methods or standards.

ii. The SAMP shall include, at a minimum, the following items: 1) a map or sketch depicting all sampling locations and the number and types of samples to be obtained at each location; 2) A. detailed description of the sampling, analysis, testing and monitoring to be performed, including sampling methods, analytical and testing methods; 3) Additional sampling locations, monitoring and analyses subsequently identified shall be submitted as an addendum to the SAMP; 4) A discussion of how the sampling, analysis, testing and monitoring will produce data useful for the response action or for other purposes; and 5) a schedule for performance of specific tasks.

j. Quality Assurance Project Plan

i. The Quality Assurance Project Plan ("QAPP") for the Response Action shall be developed by Respondents, and must be approved by EPA prior to the commencement of any sampling, testing, and monitoring activities during the Work.

ii. The QAPP shall be completed in accordance with the "Region II CERCLA Quality Assurance Manual," EPA Region II, dated March 1988, and all other guidance as specified in this Order.

iii. In order to provide quality assurance and maintain quality control with respect to all samples collected during the Work, Respondents shall ensure the following:

(1) The QAPP shall include, at a minimum, the following items:

(a) Title Page
(b) Table of Contents
(c) Project Description
(d) Project Organization and Responsibility
(e) Quality Assurance Objectives
(f) Sampling Procedures
(g) Sample Custody
(h) Calibration Procedures and Frequency
(i) Analytical Procedures
(j) Data Reduction, Validation and Reporting
(k) Internal Quality Control Checks
(l) Performance and Systems Audits
(m) Preventive Maintenance
(n) Specific Routine Procedures Used to Assess Data Precision, Accuracy and Completeness
(o) Corrective Action
(p) Quality Assurance Reports to Management

(2) Respondents shall use quality-assurance procedures and chain-of-custody procedures in accordance with standard EPA protocol.

(3) Respondents shall ensure, prior to engagement of a laboratory for the analyses of samples, that the laboratory is either a participant in good standing in EPA's Contract Laboratory Program ("CLP"), or can demonstrate its ability to perform all tasks required under the CLP.

(4) In the event that the laboratory utilized by Respondents is not CLP-certified for a relevant set of parameters, Respondents shall ensure that the laboratory will analyze performance evaluation samples submitted by EPA for those parameters for quality assurance purposes.

(5) Respondents shall ensure that the laboratory utilized for analyses of samples performs all analyses according to accepted EPA methods as documented in the "Contract Lab Program Statement of Work for Organic Analysis," dated February 1989, and the "Contract Lab Program Statement of Work for Inorganic Analysis," dated February 1989, or other EPA-approved methods.

(6) Upon receipt from the laboratory, Respondents shall promptly validate all analytical data and shall promptly submit to EPA the validation package (checklist, report and Form #1 containing the final data), prepared in accordance with the provisions of Section D.2.b.iii(7), below.

(7) Respondents shall ensure that all analytical data are validated according to the procedures stated in the "EPA Region II Contract Lab Program Organics Data Review and Preliminary Review (SOP #HW-6, Revision 7)," dated March 1990 or the latest revision, and the "Evaluation of Metals Data for the Contract Laboratory Program (SOP #HW-2, Revision 10)," dated February 1990 or the latest revision, or EPA-approved equivalent procedures.

(8) Upon request by EPA, Respondents shall promptly provide EPA with any invalidated results of all sampling and/or tests or other data generated by Respondents with respect to implementation of this Order.

(9) All analytical data shall be submitted in a CLP deliverables format, or in a similar approved format, to EPA and the State.

(10) Respondents shall ensure that all contracts with the laboratory utilized by Respondents for analyses of samples provide for access of United States Government personnel and authorized representatives of the United States for the purpose of ensuring the accuracy of laboratory results related to the Site.

(11) Completed federal and state environmental permit applications (including any required supplements) that would be required if the Selected Remedial Alternative was not conducted under the authority of CERCLA. Permit applications for Work to be done entirely on-site should not be signed.

iv. The QAPP shall also address quality assurance requirements and standards relating to construction operations. These items include, at a minimum, the following:

(1) Inspection and certification of the Work;
(2) Measurement and daily logging;
(3) Field performance and testing;
(4) As-built drawings and logs; and
(5) Testing of the Work to establish whether the components of the remedy are being implemented as specified in the ROD.

k. Health and Safety Plan/Contingency Plan

A Health and Safety/Contingency Plan ("HASCP") for the Work shall be developed by Respondents to address the protection of public health and safety and response to contingencies that could impact public health, safety and the environment during the Response Action period. The Plan shall address health and safety measures to be implemented and observed by construction personnel, as well as recommended health and safety measures for the adjacent community and general public, together with a description of the program for informing the community of these recommendations. The HASCP shall satisfy the requirements of the "Occupational Safety and Health Guidance for Hazardous Waste Site Activities," (October 1985, DHH 5 NIOSH Publication No. 85-115), and the Occupational Safety and Health Administration ("OSHA"), U.S. Department of Labor requirements cited below.

i. Site activities concerning inspections, investigations and response activities shall be performed in such a manner as to ensure the safety and health of personnel so engaged. All Site activities shall be conducted in accordance with all pertinent general industry (29 CFR 1910) and construction (29 CFR 1926) OSHA standards, as well as any other applicable state and municipal codes or ordinances. All Site activities shall comply with those requirements set forth in OSHA's interim final rule entitled "Hazardous Waste Operations and Emergency Response," 29 CFR 1910.120, Subpart H, as set forth in the Federal Register of December 19, 1986, until such time as the final rule becomes effective, at which time such activities shall comply therewith.

ii. The HASCP shall include, at a minimum, the following items:

(1) Plans showing the location and layout of any temporary facilities to be constructed on or near the Site.

(2) Description of the known hazards and

evaluation of the risks associated with the Site and the potential health impacts related to the Site activities.

(3) List of key personnel and alternates responsible for Site safety, response operations and protection of the public.

(4) Description of levels of protection (based on specified standard(s)) to be utilized by all personnel.

(5) Delineation of Work, decontamination and safe zones, and definitions of the movement of zones.

(6) Description of decontamination procedures for personnel and equipment, and handling and removal of disposable clothing or equipment.

(7) Incidental emergency procedures which address emergency care for personnel injuries and exposure problems, and containment measures. These procedures shall include evacuation routes, internal and external communications procedures and procedures for response to fires and explosions. Local agencies with the capability to respond to emergencies shall be identified and their capabilities shall be described.

(8) Description of the personnel medical surveillance program in effect.

(9) Description of monitoring for personnel and community safety.

(10) Description of routine and special personnel training programs.

(11) Description of an air monitoring program to determine concentrations of airborne contaminants to which workers on Site and to which persons beyond the Site boundary may be exposed.

3. APPROVAL OF RESPONSE ACTION WORK PLAN

a. EPA will either approve the Response Action Work Plan, or will require modification of such plan, in accordance with the procedures set forth in this Order.

b. Upon receipt of EPA's written approval of the Response Action Work Plan, Respondents shall perform the response work in accordance with the Site Management Plan and Response Action Work Plan.

4. PERFORMANCE OF WORK

During performance of the Response Action, Respondents may identify and request approval for field changes to the approved SMP for Response Action activities or the Response Action Work Plan as necessary to complete the Work. EPA will either approve, disapprove or require modification of any requests for field changes in accordance with the procedures set forth in this Order.

5. PHOTOGRAPHS

Respondents shall furnish photographs and slides to EPA that record the progress of Work including, at a minimum, the important features of the Site prior to the commencement of the Work, response activities for the various tasks, and the appearance of the Site after the Work has been completed. Such photographs and slides shall be developed expeditiously and shall be submitted as part of the monthly progress report for the month in which the photographs and slides are developed.

6. NOTICE OF COMPLETION AND FINAL REPORT FOR RESPONSE ACTION

a. Within thirty (30) calendar days after the completion of Response Action, Respondents shall submit to EPA and the State a Notice of Completion and Final Report for the Response Action. The Notice of Completion shall be signed by a qualified licensed professional engineer meeting any and all requirements of applicable federal, state and local laws, and shall certify that the Work has been completed in full satisfaction of the requirements of this Order, this Statement of Work, and all plans, specifications, schedules, reports and other items developed hereunder. The Final Report shall summarize the Work performed. If the Selected Remedial Alternative, as implemented, differs in any way from the approved plans and specifications of the Final Report, such modifications shall be reported. The reasons for all such modifications shall be described

in detail.

b. EPA will determine whether the Response Action activities or any portion(s) thereof, have been completed in accordance with the standards, specifications and reports required by this Order. If not, EPA shall notify Respondents in writing of those tasks which must be performed to complete the Response Action. Respondents shall then implement the specified activities and tasks in accordance with the specifications and schedules established by EPA, and shall then submit a further report on the specified activities and tasks and certification signed by a licensed professional engineer, within thirty (30) days after completion of the specified activities and tasks.

ATTACHMENT II

RECORD OF DECISION AND APPENDICES

WHITE CHEMICAL CORPORATION SITE

EPA 4/29

- UAO - 5/11
  - requires - SMP, SWP — deviant liability
  - Sampling
  - process

① PRP's use existing EPA profiles

② Modify UAO -
  - leave that PRP's can handle.

③ Send Bill

④ Stop EPA activity, PRP's profile

⑤ Rescinder Order

- tanks
- lab packs
- cylinders
- Security
- Piping
- ~~Waste~~

Michael McI

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

JACOB K. JAVITS FEDERAL BUILDING

NEW YORK, NEW YORK 10278

SEP 02 1992

Keith A. McKenna, Esq.
Whitman & Ransom
One Gateway Center
Newark, N.J. 07102-5398

Re: White Chemical Superfund Site, 660 Frelinghuysen Avenue, Newark, New Jersey
Progress Pollution Reports and Waste Manifests
Court Order Vacating In Rem Tax Foreclosure Judgment

Dear Mr. McKenna:

Pursuant to Paragraph 10 of the Consent Decree entered by the federal district court on December 16, 1991, I am enclosing copies of Progress Pollution Reports for the White Chemical Site dated April 8, 1992, April 10, 1992, April 17, 1992, May 1, 1992, May 8, 1992, May 15, 1992, May 22, 1992, May 29, 1992, June 5, 1992, June 12, 1992, June 19, 1992, June 26, 1992, July 3, 1992, July 10, 1992, July 17, 1992, July 31, 1992 and August 14, 1992.

In addition, pursuant to Paragraph 8 of the Consent Decree I am enclosing copies of Manifests which represent hazardous waste shipped off-site for disposal during the months of May, June and July, 1992.

With this letter, EPA has provided you with all the documents it has generated to date, or has in its possession, concerning Progress Pollution Reports, and manifests documenting the off-site disposal of hazardous substances.

On May 11, 1992, you submitted a letter on behalf of your client, AZS Corporation, notifying EPA, for the first time, that your client, AZS Corporation, was not the current landowner of the above-referenced Site. You provided court documents which indicated that the City of Newark was the current owner of the Site. The documents indicated that on October 1, 1991, the Superior Court of New Jersey entered a Final Judgment of In Rem Tax Foreclosure in favor of the City of Newark on your client's property, which is the above-referenced Site.

Please be advised that on July 14, 1992, the Superior Court of New Jersey issued an order vacating the above judgment. A copy of the order is attached. Ms. Ayesha Freeman, attorney for the City of Newark, notified me of the vacation of this judgment by letter dated August 11, 1992. According to Ms. Freeman, the

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court order applies retroactively to the time that the court entered the default judgment in favor of the City of Newark on October 1, 1991.

If you have any questions concerning the above matter please contact me.

Sincerely yours,

Bruce Aber

Bruce H. Aber
Assistant Regional Counsel

Encl.

cc: Michael Neil, OSC
Silvina Fonseca, RPM

USEPA WORK ASSIGNMENT NUMBER: 027-RICO-026J
USEPA CONTRACT NUMBER: 68-W-98-214
FOSTER WHEELER ENVIRONMENTAL CORPORATION

FINAL
REMEDIAL INVESTIGATION REPORT
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY
VOLUME I OF III

APRIL 2003

NOTICE

THE INFORMATION PROVIDED IN THIS DOCUMENT HAS BEEN FUNDED BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) UNDER RAC II CONTRACT NO. 68-W-98-214 TO FOSTER WHEELER ENVIRONMENTAL CORPORATION (FOSTER WHEELER ENVIRONMENTAL). THIS DOCUMENT HAS BEEN FORMALLY RELEASED BY FOSTER WHEELER ENVIRONMENTAL TO THE USEPA. THIS DOCUMENT DOES NOT, HOWEVER, REPRESENT USEPA POSITION OR POLICY, AND HAS NOT BEEN FORMALLY RELEASED BY THE USEPA..

BAF000039

USEPA WORK ASSIGNMENT NUMBER 027-RICO-026J
USEPA CONTRACT NUMBER 68-W-98-214
FOSTER WHEELER ENVIRONMENTAL CORPORATION

FINAL
REMEDIAL INVESTIGATION REPORT
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

APRIL 2003

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NEWARK, NEW JERSEY

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EXECUTIVE SUMMARY

INTRODUCTION

This Final Remedial Investigation (RI) Report presents and evaluates the results of the RI performed at the White Chemical Corporation (WCC) Superfund Site (CERCLIS ID#NJD980755623) (hereinafter referred to as the Site), in Newark, New Jersey. The RI was performed by Malcolm Pirnie, Inc. (Malcolm Pirnie) on behalf of the United States Environmental Protection Agency (USEPA), Region II. Work on the RI was initiated by Malcolm Pirnie under their Alternative Remedial Contracting Strategy (ARCS), Contract Number 68-W9-0051, Work Assignment Number 052-26JC and completed by Malcolm Pirnie under Foster Wheeler Environmental Corporation's (FWENC) Response Action Contract (RAC), Contract Number 68-W-98-214, Work Assignment No. 027-RICO-026J. The RI was performed in accordance with the approved ARCS planning documents.

The purpose of the RI is to characterize the nature and extent of contamination associated with the Site and to assess the risks posed to human health and the environment by the presence of that contamination. The results of the RI presented herein identify volatile organic compounds (VOCs) as contaminants of concern and partially identify suspected source areas. The results of the RI also indicate that the horizontal and vertical limits of groundwater contamination are not fully defined and extend beyond the site boundaries, potential source areas remain uncharacterized in the unsaturated soil, dense non-aqueous phase liquids (DNAPLs) may exist on the Site, and the direction of the shallow groundwater flow is not completely understood and may be influenced by a flooded underground tunnel that exists on the Site.

The FS will be prepared based on the information in this Final RI Report. In addition, the limitations of the RI data and the assumptions used in developing remedial cleanup alternatives will be described in the FS Report.

BACKGROUND

The Site, which measures 4.4 acres, is located at 660 Frelinghuysen Avenue (Block 3872, Lot 109), Newark, Essex County, New Jersey. Frelinghuysen Avenue is a major thoroughfare with significant residential, commercial, and industrial populations. The eastern Site border is adjacent to Conrail and Amtrak rail lines that serve as a major rail corridor to New York City. The Newark brewery of Anheuser-Busch, Inc. is located approximately 1,000 yards east of the railroad line. U.S. Highway Routes 1 and 9 and Newark International Airport lie approximately 0.5 miles further east. Weequahic Park, several large housing complexes and several high-rise senior citizen residences are also located nearby. Five major buildings (Building Numbers 33, 34, 34A, 35 and 36) and three smaller, facility support buildings (Boiler Room, Pump House and Maintenance Shop) are located on the Site. A Decon Shed, erected during the USEPA removal action, is also present.

WCC leased the Site in 1983 and moved its operations from Bayonne, NJ to the Newark site. The Bayonne site, which is still under active enforcement by the New Jersey Department of Environmental Protection (NJDEP), is listed in the NJDEP's Known Contaminated Site List. WCC continued operations in Newark until 1990, manufacturing a variety of acid chlorides, brominated organics, mineral acids and fire retardant compounds. The finished products, mostly solids and powders, were generally formulated in small batches following individual customer's specifications. WCC produced three primary groups of chemical products: acid chlorides,

brominated organics (both aliphatic and aromatic) and mineral acids, most notably hydriodic acid.

Beginning in 1989 and continuing through the present, the Site has been the subject of numerous inspections, site assessments, investigations, and removal actions. Between May and August 1990, the NJDEP removed approximately 1,000 drums from the Site. Between 1990 and 1991, the USEPA removed several thousand drums and performed several assessments at the Site. By March 1993, a potentially responsible party (PRP) group, operating under a Unilateral Administrative Order (UAO), removed approximately 7,900 drums, the contents of more than 100 tanks, approximately 12,500 laboratory chemical containers, approximately 50,000 gallons of liquid contained in process tanks, and 14 gas cylinders.

Based on the known contamination at the property, the USEPA proposed the Site for inclusion on the National Priorities List (NPL) on May 9, 1991, and the Site was listed on September 25, 1991. The record of decision (ROD), which was issued on September 26, 1991, required appropriate security measures, stabilization of the Site, on-site treatment or neutralization of contaminated material, off-site treatment, recycling or disposal of contaminated material, decontamination and off-site disposal or recycling of empty drums and containers, decontamination of on-site storage tanks and process piping, and appropriate environmental monitoring.

In 1998, the USEPA Environmental Response Team (ERT) conducted a soil and building material investigation at the Site. Results of the sampling activities indicated the presence of heavy metals and polybrominated biphenyls (PBBs) in soil, sump sediment, and building material wipe samples. Semi-volatile organic compounds (SVOCs), heavy metals, and dioxin were also found in the soils and sediments, and asbestos was found in the on-Site buildings. The ERT investigation is one of the only known sampling activities to take place at the Site prior to the RI investigation. Limited air sampling was conducted prior to the drum removal; however, no subsequent air sampling is documented. The air sampling showed the presence of amines, sulfuric acid and volatile organic compounds (VOCs).

FIELD INVESTIGATIONS

The purpose of the field investigation was to obtain valid data to evaluate the potential sources of contamination by defining the nature, depth and extent of contamination resulting from operations at the Site. The following field activities were completed during the RI investigation:

- Geophysical Survey
- Surface and Subsurface Soil Investigation
- Hydrogeologic Investigation
- Building Investigation
- Surface Water and Sediment Investigation
- Ecological Investigation
- Cultural Resource Surveys

Geophysical Survey

Magnetic, electromagnetic induction (EM), and ground penetrating radar (GPR) surveys were conducted to determine the presence of subsurface structures which would affect the

location of the test pits and soil borings. All of the surveys indicated the presence of several anomalies of unknown origin.

Surface and Subsurface Soil Investigation

Six test pits were excavated on the northern and eastern portions of the Site. The test pits were located in former drum storage/tank areas, in an area where free product was detected in a soil sampling location, or were located over magnetic anomalies discovered during the geophysical surveys. The objective of the test pit excavations was to determine if buried waste was present on the Site.

Seventy-five surface soil samples were collected across the Site from former drum storage areas, along the edges of concrete pads that support aboveground storage tanks (ASTs), and in open areas. The purpose of the surface soil sampling was to characterize the nature and extent of contamination, identify source(s) of contamination, and assess the dermal/inhalation pathway associated with surface soil contaminants.

Thirty shallow soil borings were advanced on the Site to assess the presence, nature, and extent of contamination in the vadose zone, define Site stratigraphy, including determining the presence or absence of tidal marsh deposits, and install seven shallow monitoring wells. The soil borings were located in or adjacent to former drum storage areas, adjacent to or downgradient of AST areas, in open areas on the Site, near a former swale area, adjacent to the on-site swale, in the location of a former coal pile on-Site, near the sump in Building No. 34, and near the sump in Building No. 33. In addition, four off-site soil borings were advanced in Weequahic Park to characterize background soil quality.

Hydrogeologic Investigation

Eleven monitoring wells, seven shallow and four deep, were installed on the Site to assess the groundwater quality, obtain groundwater level elevations to determine the groundwater flow direction, and estimate the hydraulic characteristics of the aquifer. Two rounds of groundwater samples were collected approximately five months apart. During each round of sampling, the purge water was continuously monitored for temperature, specific conductance, Eh, pH, dissolved oxygen (DO) and turbidity, and recorded approximately every five minutes. In addition, four synoptic rounds of groundwater elevations were collected to determine the horizontal direction of groundwater flow.

Slug tests were also performed on each monitoring well to estimate the hydraulic conductivity of the unconsolidated deposits. Both rising and falling head slug tests were conducted on the four deep wells. Rising head slug tests were performed on the seven shallow wells.

Building Investigation

During the building investigation, several different types of samples, including asbestos, lead paint, building material, and wipe samples, were collected. Asbestos samples were collected to locate and identify all accessible friable and non-friable asbestos containing material (ACM). A lead-based paint survey and investigation, which included collecting x-ray fluorescence (XRF) measurements as well as paint chip samples, was conducted to identify the presence of any lead-based paint. Building materials were sampled to determine if building debris should be classified as hazardous or non-hazardous under the Resource Conservation and

Recovery Act (RCRA). Finally, wipe samples were collected to determine the extent and distribution of surface contamination in the buildings.

Surface Water and Sediment Investigation

Two sump sediment samples were collected from the Site to determine what types of materials may have been used in the buildings and determine if the sumps/floor drains could be potential sources of soil and groundwater contamination. Storm sewer, sediment, and surface water samples could not be collected because no storm sewers could be located on the Site and no intermittent or perennial surface water bodies existed from which to collect a surface water/sediment sample.

Ecological Investigation

A discussion of the ecological resources present at the Site and in the vicinity of the Site is presented. A screening-level ecological risk assessment to address the potential risks to wildlife receptors is presented in Chapter 3.0 of the Final Risk Assessment Report (Malcolm Pirnie, 2003).

A reconnaissance was conducted to determine if State-regulated wetlands are located on the Site and to assess whether any flora and fauna habitat are present. Based on information obtained from National Wetlands Inventory (NWI) maps, as well as observations made during the reconnaissance, it was determined that no Federal or State regulated wetlands are located within the Site boundaries. Several small patches containing some typically hydrophytic vegetation exist within the Site boundaries; however, since hydric soils are not present, these areas do not meet the criteria for a wetland. The dominant vegetation in this area was less than 50% hydrophytic.

The majority of the surface areas at the Site consist of abandoned buildings and pavement; however, some scrub/shrub type vegetation, typical of disturbed urban areas, exists along the northern, eastern and southern borders. Wildlife use of the Site is expected to be minimal due to its limited size (4.4 acres) and disturbed nature, its location within an active urban area, and lack of diverse vegetation communities. The only wildlife observed during the December site visit were pigeons (*Columba livia*) and several sparrows (Family *Emberizidae*). Feral dogs have been observed on the Site during RI activities, and it is likely that mice and rats may utilize the Site as well. Duration of use by any wildlife species, in general, is expected to be sporadic since the Site offers limited habitat value.

To determine the potential for threatened and/or endangered species to be present on the Site, the New Jersey Natural Heritage Program (NHP) was contacted. None of their records indicate that rare plants, animals or natural communities are present. It is unlikely that threatened/endangered species would utilize the Site due to the lack of adequate habitat.

Cultural Resource Surveys

Both a Stage Ia and Ib archaeological investigation of the Site were conducted. The objectives of the Stage Ia archaeological investigation were to 1) determine the likelihood that possibly significant cultural resources were present within the Site; 2) preliminarily evaluate the architectural and historical significance of existing Site buildings; and 3) determine if any further archaeological investigations were necessary. The results of this survey indicated the following:

- Buried marsh deposits and other former ground surfaces, which must be considered potential cultural-ecological deposits, may be preserved within the Site.

- There are no Historic Period domestic or commercial/industrial structures located within the Site. The nearest Historic period structures, two mid to late nineteenth century domestic residences, were located west of the Site fronting on Frelinghuysen Avenue.

- None of the Site structures were potentially significant in terms of their architectural characteristics or the role they may have played in industrial history.

It was recommended that archaeological borings be advanced on the Site to determine whether any buried former ground surfaces are present, particularly beneath tidal or fresh water marsh deposits. These borings were not intended to test for the presence of cultural material but to determine the stratigraphy present and its potential for containing evidence of Native American occupation. No other recommendations were made in the Stage Ia report.

During the Stage Ib investigation, sample soil borings, advanced during the RI investigation, were archaeologically analyzed. Indications of a buried organic peat-like layer and an underlying layer of gray silty clay, possibly representing a former ground surface, were found at one location. Analysis of the remaining soil borings revealed only the presence of fill soils and naturally occurring deposits. None of those strata are considered to have potential archaeological value. It was recommended that if extensive soil removal occurred in the vicinity of the peat-like layer, further archaeological investigation of that area should first be conducted. However, if subsurface impact does not occur in this area, further archaeological investigation of that location would not be required. No other recommendations were presented in the Stage Ib report.

RESULTS OF THE FIELD INVESTIGATIONS

The nature and extent of contamination at the Site is based on validated data obtained from the RI investigation. Samples collected include surface and subsurface soil, sump sediment, groundwater, and building materials. All soil samples were analyzed for full Target Compound List (TCL)/Target Analyte List (TAL), including cyanide. In addition, selected soil samples were analyzed for one or more of the following parameters: total phenols, pH, total organic carbon (TOC), cation exchange capacity (CEC), toxicity characteristic leaching procedure (TCLP) parameters, PBBs, dioxin, moisture content, grain size, bulk density, and atterberg limits. All sump sediment samples were analyzed for full TCL/TAL, including cyanide, total phenols, pH, TOC, TCLP parameters, PBBs, moisture content, and grain size. All groundwater samples were analyzed for full TCL, full TAL (total and dissolved), cyanide, total phenols, TOC, nitrate, alkalinity, sulfate, total dissolved solids (TDS), chloride, and PBBs. Based on the type of sample, the building materials were analyzed for various parameters including asbestos, lead, full TCL/TAL, including cyanide, total phenols, PBBs, and TCLP parameters.

Determination of Site-Specific Background

Two background soil samples were collected from Weequahic Park to represent background conditions for VOCs, SVOCs, pesticides/polychlorinated biphenyls (PCBs), total phenols, PBBs, and dioxin. One sample was collected from 2 - 4 feet below ground surface (bgs) and one sample was collected from 8 - 10 feet bgs. Five background soil samples were collected from Weequahic Park to represent background conditions for inorganics, including cyanide. The Site-specific background concentrations for inorganics were obtained by averaging the five samples. Weequahic Park was chosen as representative of background since the sample locations were in areas that are not known to be affected by Site activities.

During installation of the 11 monitoring wells, two wells were installed on the northwestern portion of the Site in the presumed upgradient direction. However, water level measurements collected from the wells suggested the presence of a groundwater divide on the northern portion of the Site. Therefore, a suitable on-site upgradient well was not present. In order to determine background groundwater conditions in the Site vicinity, a search of the NJDEP Environmental Cleanup Responsibility Act (ECRA) files was conducted. The analytical data from three cross-gradient ECRA wells were used to determine background for VOCs. Only VOC data was available.

Contaminant Sources

A large variety of chemicals were used in WCC's operations in order to manufacture a variety of acid chlorides, brominated organics, mineral acids and fire retardant compounds. The contamination at the Site is believed to be a result of the improper staging, control and maintenance of these chemicals that were contained in drums, laboratory containers, storage tanks and process tanks. A variety of contaminants were detected in the soil, sediment and groundwater samples at a wide range of concentrations. The source(s) of the contamination in groundwater has not been definitively identified. The concentration of several VOCs in the groundwater are higher than those same constituents in soil. The contamination in soil is not present throughout the soil column, but mainly in the upper two feet.

Surface and Subsurface Soil

VOCs were detected in numerous surface and subsurface soil samples at concentrations that exceeded the USEPA Soil Screening Levels (SSLs) and/or the NJDEP Soil Cleanup Criteria (SCC) (i.e., To be considered materials (TBCs)). A total of 13 VOCs were detected in the surface soil and six VOCs were detected in the subsurface soil at concentrations that exceeded the TBCs; the majority of these are chlorinated VOCs (e.g., tetrachloroethene). Contamination in the surface soil is distributed throughout the Site while the subsurface contamination is primarily found near the eastern/northeastern Site boundary. Although VOC contamination was found at depths up to 12 feet bgs, the majority of the contamination is found in the top two feet.

Twelve SVOCs were detected in the surface soil and six SVOCs were detected in the subsurface soil at concentrations that exceeded the TBCs. The majority of these compounds are polycyclic aromatic hydrocarbons (PAHs). Three primary areas at the Site contain surface soil SVOC contamination above the TBCs; the northern section (between the gate and the eastern Site boundary), the southeast corner (south of the concrete tank pad connected to Building No. 35), and the center of the Site (between Building Nos. 34 and 35). Subsurface soil SVOC contamination at concentrations above the TBCs was primarily found near the center of the Site.

Although SVOC contamination was found at depths up to ten feet bgs, the majority of the contamination is found in the top two feet.

Nine pesticides/PCBs were detected in the surface soil and one pesticide was detected in the subsurface soil at concentrations that exceeded the TBCs. In general, elevated pesticide/PCB concentrations were found in very few soil samples and at shallow depths (< 4 feet). Pesticide/PCB contamination was primarily limited to the eastern portion of the Site.

Detectable levels of PBBs were found in nine of 23 surface soil samples and one of eight subsurface soil samples, but below the NJDEP NRDCSCC and the USEPA Region 3 non-residential SSL. Contamination in the surface soil is found throughout the Site. PBBs were found at a maximum depth of 3.5 feet bgs.

Numerous inorganics were found in all of the surface and subsurface soil samples. Altogether, 10 metals were detected in the surface soil and three metals were detected in the subsurface soil at concentrations that exceeded both the average background concentrations and the TBCs. Thirty-five surface soil samples and approximately half of the subsurface soil samples contained heavy metals at concentrations that exceeded the TBCs and Site-specific background. Contamination in both the surface and subsurface soil is distributed throughout the Site. The majority of the metal contamination is present in the top two feet of soil; however, significant contamination is present at depths up to 12 feet bgs.

Twenty surface soil and four subsurface soil samples were analyzed for TCLP parameters. The majority of the compounds/analytes were detected at trace levels; however, one surface soil sample contained a TCLP contaminant at a concentration that exceeded the ARAR. Based on these results, the majority of the samples would not be characterized as a RCRA hazardous waste.

Detectable levels of dioxins were found in all 11 surface soil samples analyzed for this compound; however, none were detected at concentrations that exceeded the TBC. Although a limited number of surface soil samples were analyzed for dioxins, these samples provided spatial coverage of the majority of the Site.

Sump Sediment

Twelve VOCs (mainly chlorinated compounds), six SVOCs (mainly PAHs), eight pesticides, five metals, and one TCLP compound were detected in the sump sediment samples at concentrations that exceeded the ARARs/TBCs. In addition, detectable levels of PBBs were found in both samples. The majority of the contamination was found in the sump sediment sample collected from Building No. 34. VOC concentrations measured in the sump are sufficiently high to indicate that free-phase product may have accumulated in the sump. Residual contamination may exist around and under this sump.

Groundwater

Four rounds of synoptic water level measurements indicate that shallow groundwater flow radiates from a mound that exists in the vicinity of Building No. 34, thereby, creating a groundwater divide across the center portion of the Site. Mounding of groundwater in the vicinity of Building No. 34 may be caused by the flooded tunnel that exists under this building. Shallow groundwater flow radiates away from the divide in the northern portions of the Site; south of the divide groundwater flows more uniformly to the south. The groundwater divide is less evident at depth. The direction of deeper groundwater flow is fairly consistent with the

shallow groundwater flow and follows the surface of the underlying bedrock. In the southern portions of the Site, the main component of groundwater flow at depth is to the south, with groundwater flow in the northern portion of the Site varying from northeasterly to southeasterly. Synoptic water level measurements in the four pairs of shallow and deep wells (MW-1S/1D, MW-3S/3D, MW-5S/5D and MW-7S/7D) also indicate a downward vertical gradient across the Site.

Analysis of two rounds of groundwater samples indicated the presence of a variety of organic and inorganic contaminants; however, only chlorinated VOCs, inorganics, and several water quality parameters were found at concentrations that exceeded USEPA MCLs and/or NJDEP GQCs. Every well contained VOCs at concentrations that exceeded the ARARs. The concentration of many VOCs in the groundwater are higher than those same constituents in soil.

Trace levels of SVOCs, pesticides, and PCBs were detected in the groundwater; however, none of these compounds were detected at a concentration that exceeded the ARARs.

Analysis for inorganics indicated the presence of 21 metals and cyanide; however, only eight metals (aluminum, antimony, cadmium, iron, lead, manganese, sodium, and thallium) were detected at concentrations that exceeded the ARARs. Four of these metals, aluminum, iron, manganese, and sodium were not detected in the soil at concentrations that exceeded the TBCs and/or the Site-specific background concentration. The remaining four metals (i.e., antimony, cadmium, lead, and thallium) were all detected in the on-site soil at concentrations that exceeded the TBCs and the Site-specific background concentrations. The source(s) of the contamination in groundwater has not been definitively identified.

The direction of groundwater flow from the monitoring wells along the southern and eastern Site boundaries is off-Site. It appears that contaminants may have migrated off-Site and, therefore, the full horizontal and vertical extent of groundwater contamination is undefined.

A comparison of the concentration gradient of 1,2-dichloroethane reflects an increasing concentration gradient with depth that is sufficiently high to indicate the presence of DNAPL. It is likely, therefore, that DNAPL is present at the Site and has migrated at least to the top of the weathered bedrock. Monitoring of the groundwater in bedrock was beyond the scope of this RI; however, it is also possible that DNAPL has migrated into the bedrock.

Building Materials

Asbestos (both friable and non-friable) was found in all of the Site buildings except the Decon Shed and Pump House. The majority of the ACM were materials associated with insulation, flooring, and roofing. The remaining ACM were from laboratory related furnishings, caulkings, and miscellaneous debris.

Lead-based paint was detected in Building Nos. 33, 34, 35, and 36, the Boiler Room, and the Pump House. With the exception of a wooden door casing, all lead-based paint was found on steel or other metal substrates such as columns, beams, railings, windows doors, stairs, ladders, a wall, an elevator, and a fire escape.

One TCLP compound (1,2-dichloroethane) was detected in a building material sample at a concentration that exceeded the RCRA TCLP regulatory limit. This sample was collected from the exterior of Building No. 33.

Wipe samples were collected from three buildings; Building Nos. 33, 34, and 35. Analysis of these samples indicated the presence of 24 SVOCs, eight pesticides, PBBs, and 21

metals. None of the detected concentrations can be compared to any standards since there are no federal or state ARARs/TBCs for wipe samples.

FATE AND TRANSPORT

There are numerous site and chemical specific factors that determine the fate (i.e., transport and transformation) of contaminants in the environment. Site-specific factors include soil characteristics (TOC, CEC, pH, and soil particle size), hydraulic gradient, and cover material. TOC can be used to predict the potential leachability of a chemical from contaminated soil and any retardation of the chemical as it migrates through the aquifer. The majority of the soils at the Site have TOC concentrations greater than 10,000 milligrams per kilogram (mg/kg). CEC refers to the number of positively charged ions a soil can hold, and can be used to predict the extent of migration of metals to groundwater. The higher the CEC value, the better the soil is at immobilizing divalent metal ions. CEC values at the Site ranged from 904 parts per million (ppm) to 5,440 ppm. Soil pH values can be an important factor in transformation processes (i.e., biodegradation) since most bacteria have their growth optimum at relatively neutral values (i.e., > 6 and < 8). Although there are a few outliers, the majority of the soils across the Site have pH values between 5 and 8. Soil particle size can be used to obtain a rough estimate of the amount of percolation that may occur following precipitation. The average grain size distribution, estimated from nine soil samples collected throughout the Site, consisted of approximately 7% gravel, 63% sand, and 30% silt and clay.

The average horizontal gradient in both the upper and lower water table is approximately 0.002 feet/foot, indicating that the water table is relatively flat. Groundwater flow is likely to follow preferential pathways that are expected to occur.

Cover material on a site affects volatilization of contaminants from the soil, the amount of precipitation that can percolate through the vadose zone, windborne dust and surface runoff. The majority of the ground surface at the Site is paved with either concrete or asphalt. This greatly reduces migration through volatilization, runoff, windborne dust, and the downward percolation of water to the groundwater.

Chemical-specific factors include water solubility, the partitioning coefficients [organic carbon partition coefficient (K_{oc}) and octanol/water partitioning coefficient (K_{ow})], and vapor pressure. Water solubility and the partitioning coefficients can be used to determine whether a contamination is more likely to sorb onto organic matter in the soil or solubilize into the groundwater. The vapor pressure of a chemical is directly related to the rate at which it volatilizes. All of these site and chemical specific factors influence the transport and transformation processes that a contaminant will undergo.

Transport and transformation processes that could be affected by both Site and chemical specific factors include advection-dispersion, attenuation onto soils, facilitated transport (cosolvation and particle transport), volatilization, complexation, biodegradation, biotransformation, oxidation-reduction (redox) reactions, bioactivation, and precipitation. It should be noted that extensive data regarding soil and groundwater chemistry or microbiology was not collected. Therefore, conclusive statements regarding Site factors that might influence biodegradation, biotransformation, bioactivation, oxidation-reduction reactions, precipitation or complexation cannot be made.

VOCs, SVOCs, pesticides/PCBs, metals, and PBBs were all detected in soil at the Site. Generally, VOCs have high water solubilities, high biodegradability under appropriate

conditions, and low partition coefficients. Due to these factors, VOCs tend to migrate to the groundwater faster than the other organics. These factors also indicate that the process of facilitated transport for the VOCs is probably insignificant. At this Site, migration of VOCs from the soils to the groundwater appears significant. This is likely due to their chemical properties (as described above), the high percentage of sand in the Site soil, and the presence of high concentrations of VOCs in the soil.

Generally, SVOCs have relatively high partitioning coefficients and low water solubilities. The majority of the SVOCs detected in the soil at concentrations above the TBCs were PAHs, a subclass of the SVOCs. PAHs have very high sorption coefficients and are usually strongly to very strongly sorbed to organic matter. In addition, many PAHs are relatively insoluble in water. Due to these factors, SVOCs are more likely to be sorbed to the organic matter in surface soil than migrating down the soil column although minimal migration could occur through large volume spills, cosolvent facilitated transport, or a combination of factors. At this Site, migration of SVOCs from surface soils to the groundwater is not significant.

Generally, pesticides/PCBs have high sorption coefficients, low biodegradability, and are either insoluble in water or have very low water solubilities. Due to these factors it is unlikely that they will migrate from the surface soil to the groundwater at significant concentrations although they could potentially migrate through facilitated transport. Pesticides/PCBs were detected in several surface soil samples at concentrations exceeding the TBCs; however, only trace amounts (well below ARARs/TBCs) were detected in the subsurface soil and groundwater samples. This indicates that migration of these chemicals at the Site is minimal.

Chemically, PBBs are very similar to PCBs. They are nearly insoluble in water; however, they are slightly to highly soluble in organic solvents and are highly soluble in fat. PBBs are chemically unreactive compounds that resist metabolic breakdown in biological tissues. PBBs were detected in several surface soil samples; however, they were only detected in one subsurface soil sample. In addition, only trace amounts were detected in the groundwater samples, indicating that mobility of PBBs down the soil column and into the groundwater is extremely limited at the Site.

Heavy metals in soil are subject to a variety of transport and transformation processes including complexation reactions, redox reactions, precipitation, attenuation onto soils, facilitated transport, and advection and dispersion when dissolved in groundwater. In general, heavy metals introduced into soil will be affected by these processes until an equilibrium condition is achieved. However, as soil conditions change the equilibrium may change, resulting in the further migration of inorganics through the soils and into the groundwater. Heavy metals are not usually subject to biodegradation. At the Site, heavy metals were detected in nearly all of the surface soil samples and approximately half of the subsurface soil samples at concentrations exceeding the TBCs and Site-specific background. Numerous metals were also found in the filtered and unfiltered groundwater samples at concentrations exceeding the ARARs. In most cases, the metal concentrations detected in the unfiltered groundwater samples were much higher than the concentrations detected in the filtered groundwater samples. This indicates that many of the inorganics in groundwater are sorbed to soil particulates. Facilitated transport is, therefore, an important mechanism of transport for inorganics at the Site.

RECOMMENDATIONS

Additional investigations to fill data gaps are recommended. Data gaps identified based on the RI data include the following:

- Define the horizontal and vertical limits of groundwater contamination.
- Confirm the shallow groundwater flow direction and the potential influence of the flooded underground tunnel near Building No. 34.
- Investigate the potential for DNAPL in the soil and bedrock.
- Investigate potential source areas in the unsaturated soils.

These data gaps will be addressed by the USEPA in the predesign phase of the project.

1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

The purpose of this Final Remedial Investigation (RI) Report is to present and evaluate the results of the RI performed at the White Chemical Corporation (WCC) Superfund Site (CERCLIS ID#NJD980755623) (hereinafter referred to as the Site), in Newark, New Jersey. The RI was performed by Malcolm Pirnie, Inc. (Malcolm Pirnie) on behalf of the United States Environmental Protection Agency (USEPA), Region II. Work on the RI was initiated by Malcolm Pirnie under their Alternative Remedial Contracting Strategy (ARCS), Contract Number 68-W9-0051, Work Assignment Number 052-26JC and completed by Malcolm Pirnie under Foster Wheeler Environmental Corporation's (FWENC) Response Action Contract (RAC), Contract Number 68-W-98-214, Work Assignment No 027-RICO-026J. The RI was performed in accordance with the approved ARCS planning documents including the RI/Feasibility Study (FS) Work Plan (Malcolm Pirnie, 1998a), Field Sampling Plan (FSP) (Malcolm Pirnie, 1998b) and Quality Assurance Project Plan (QAPjP) (Malcolm Pirnie, 1998c), the RAC Letter Work Plan (FWENC, 1999), and the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986.

The purpose of the RI is to characterize the nature and extent of contamination associated with the Site and to assess the risks posed to human health and the environment by the presence of that contamination. The results of the RI presented herein indicate that the horizontal and vertical limits of groundwater contamination are not fully defined and extend beyond the site boundaries, potential source areas remain uncharacterized in the unsaturated soil, dense non-aqueous phase liquids (DNAPLs) may exist on the Site, and the direction of the shallow groundwater flow is not completely understood and may be influenced by a flooded underground tunnel that exists on the Site.

The FS will be prepared based on the information in this Final RI Report. In addition, the limitations of the RI data and the assumptions used in developing remedial cleanup alternatives will be described in the FS Report.

1.2 SITE BACKGROUND

1.2.1 Site Description

The Site, which measures 4.4 acres, is located at 660 Frelinghuysen Avenue (Block 3872, Lot 109), Newark, Essex County, New Jersey. Major Site features include nine buildings, a former aboveground storage tank (AST) farm (tank farm), an underground tunnel, and a railroad spur. Five major buildings (Building Numbers 33, 34, 34A, 35 and 36), three smaller, facility support buildings (Boiler Room, Pump House and Maintenance Shop), and a decontamination (decon) shed are located on the western portion of the property[1]. The majority of these buildings are grouped around the former tank farm located near the center of the Site. The entire tank farm

[1]For the purposes of this report, the terms north yard and south yard will refer to the open areas northeast and southeast, respectively, of the Site buildings.

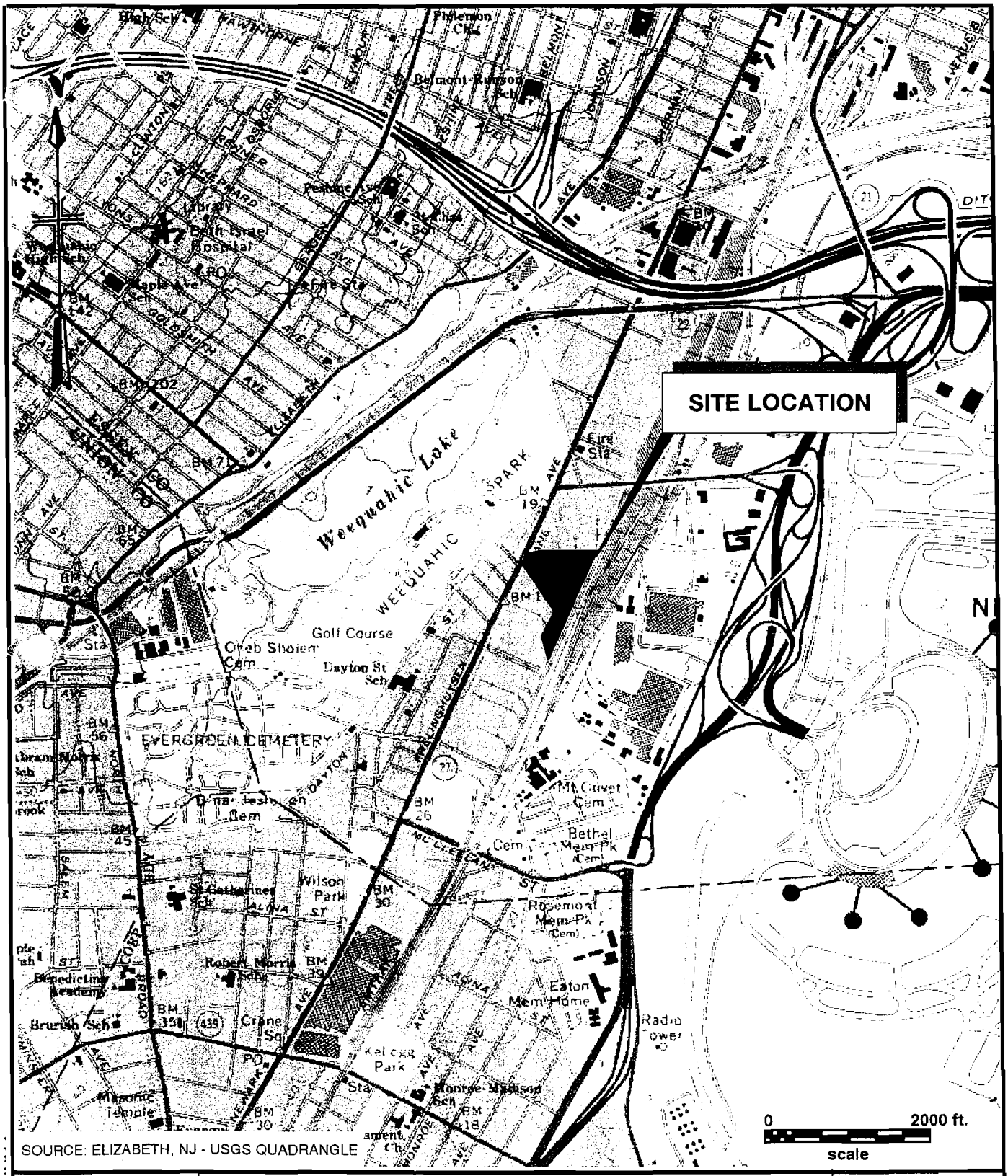
is underlain by a thick (at least 18 inches) slab of concrete. Building Nos. 34 and 34A are located north of the tank farm. These two buildings are connected by a hallway on the south side and are separated by an alley on the north side. An underground tunnel originates in the western portion of Building No. 34 and leads to the south. The depth, usage, and destination of the tunnel are unknown. Adjacent to the northwest side of Building No. 34 is a decon shed erected during a USEPA removal action at the property (refer to Section 1.3.2). Building Nos. 33 and 35 are located west and south, respectively, of the tank farm. A concrete pad, used for ASTs, abuts the eastern side of Building No. 35. Adjacent to the AST farm are the Boiler Room (southwest side), Pump House (northwest side), and Maintenance Shop (eastern side). Building No. 36, the only building removed from the tank farm area, is located on the southern portion of the Site. Also on the southern portion of the property is a ditch formed by a railroad spur. The majority of the Site is paved, with small patches of exposed dirt (and some vegetation) on the northern and southern portions of the property as well as in the area surrounding Building No. 36.

Frelinghuysen Avenue is a major thoroughfare with significant residential, commercial, and industrial populations. The Site is located immediately east of Sleepline Industries, which burned down in the 1990s. Airport Industrial Center and Lucent Technologies are located northwest of the Site. The eastern Site border is adjacent to Conrail and Amtrak rail lines that serve as a major rail corridor to New York City. The Newark brewery of Anheuser-Busch, Inc. is located approximately 1,000 yards east of the railroad line. U.S. Highway Routes 1 and 9 and Newark International Airport lie approximately 0.5 miles further east. Weequahic Park, several large housing complexes, several high-rise senior citizen residences, several cemeteries, and a school are located to the west, within 0.4 miles of the Site. A Site Location Map and Site Base Map (detailing significant Site features) are presented in Figure 1-1 and Plate 1, respectively.

1.2.2 Early Site History (pre-1983)

Fire Insurance Maps (Sanborn, 1996) and historical aerial photographs were reviewed by Malcolm Pirnie to evaluate activities on and near the Site prior to WCC's operations. Sanborn maps of the Site and surrounding area dating back to 1931 show an athletic track and field, including a grandstand, on the eastern portion of the property. Adjacent to and on the western portion of the Site, there was an industrial complex for the Oxweld Acetylene Company, which manufactured flashlights and welding machines. This industrial complex included a large coal pile and incinerator (both appear to extend onto the Site) as well as two railroad sidings. These same features were still present on a 1950 Sanborn map. Buildings (Numbers 33, 34, and 34A) are first shown on the property on the 1966 Sanborn map. Construction dates for the buildings range from 1951 to 1957. By 1973, the railroad sidings and coal pile were gone having been replaced by three large underground storage tanks (USTs) (two 10,000-gallon and one 25,000-gallon). Subsequent close examination of the map indicated that the underground tanks were located north Building No. 34 and outside the boundaries of the Site. On the 1973 map, the Site is labeled the Linde Company, a Division of Union Carbide Corporation (Commercial Laundry). On the 1988 and 1994 Sanborn maps, the owner of the property fronting on Frelinghuysen Avenue is listed as the Central Services Corporation (CSC) of Metropolitan New Jersey. The Site is labeled Lancaster Chemical. No other changes were noted from the 1973 map.

In September 1970, CSC purchased the Site from Union Carbide Corporation. It is



SOURCE: ELIZABETH, NJ - USGS QUADRANGLE

MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

SITE LOCATION MAP

MALCOLM PIRNIE, INC.

FIGURE 1-1

believed that much of the present infrastructure on the Site, including sewer and utility conduits and buildings, may date from Union Carbide's ownership. Aerial photos taken in 1970 show a very neat and orderly property. In August 1975, CSC sold the property to the Lancaster Chemical Company, a division of AZS Corporation. Very little information is known of Union Carbide's, CSC's, or Lancaster's operations at the Site. Copies of the Sanborn maps and aerial photographs are presented in Appendices A and B, respectively.

1.2.3 Recent Site History (post-1983)

In 1983, WCC leased the Site from AZS Corporation and moved its operations from Bayonne, NJ to the Newark site. The Bayonne site is still under active enforcement by the New Jersey Department of Environmental Protection (NJDEP) and is listed in the NJDEP's Known Contaminated Site List. WCC continued operations in Newark until 1990, manufacturing a variety of acid chlorides, brominated organics, mineral acids and fire retardant compounds. The finished products, mostly solids and powders, were generally formulated in small batches following individual customers' specifications.

WCC produced three primary groups of chemical products: acid chlorides, brominated organics (both aliphatic and aromatic) and mineral acids, most notably hydriodic acid. A brief summary of their products and processes is presented below. Acid chlorides are functional substitution derivatives of carboxylic acids and were produced by the simple reaction of phosphorous trichloride with a carboxylic acid. Although acid chlorides are not a common or generally useful end product, they are essential intermediates for the production of other organic compounds. Esters, amides, phenyl ketones, aldehydes, anhydrides, neo-alcohols and acid cyanide are produced with acid chloride precursor compounds. These end products have a multitude of commercial and domestic applications ranging from pharmaceuticals to cosmetics.

Aliphatic and aromatic brominated materials were produced by substitution reactions with alcohols, carboxylic acids and diphenyloxide. Brominated organics have a wide variety of potential uses. One major category of brominated organics, namely alkyl bromides, was an extremely useful intermediate and was used most frequently as an alkylating agent. End products that resulted from the use of alkyl bromides included perfume oils, pharmaceuticals, dyestuffs and agricultural chemicals. Of the aromatic brominated compounds, WCC produced decabromodiphenyloxide, which is a flame retardant. Precursor chemicals in the manufacture of decabromodiphenyloxide have been known to contain polybrominated biphenyls (PBBs). No information is available on the production of hydriodic acid.

No NJ Pollution Discharge Elimination System (NJPDES) or treatment, storage, and disposal facility (TSD) permits could be found for the Newark facility although the Bayonne facility had a NJPDES and air permits. It is not known if the Newark facility had a Significant Industrial Usage (SIU) permit.

1.2.4 White Chemical Bayonne Facility

Laboratory analyses of soil samples collected at the Bayonne facility indicated the presence of a wide range of constituents including volatile organic compounds (VOCs), metals, semi-volatile organic compounds (SVOCs) and brominated compounds. PBBs were ubiquitous at the Bayonne facility and were detected in soils, receiving waters, fish and the hair of WCC workers. Due to the use of certain precursor chemicals at the Bayonne facility, analysis of the soils for dioxin was performed. The presence of dioxin was not confirmed at the Bayonne

facility since there was matrix interference caused by the presence of other contaminants. NJDEP's administrative record for the Bayonne facility recommended that dioxin be included in any future sampling plan.

1.3 PREVIOUS REMOVAL ACTIONS AND INVESTIGATIONS

1.3.1 NJDEP Removal Actions

NJDEP conducted several inspections of WCC's Newark facility between June and September 1989 pursuant to the Resource Conservation and Recovery Act (RCRA). During these inspections, NJDEP issued several Notices of Violation (NOV) for a variety of infractions including improper drum management, leaking drums, open containers and inadequate aisle space. On September 22, 1989, the Site was reinspected and it was noted that the facility had attained only partial compliance. As a result, an Administrative Order and penalty were issued on March 15, 1990. According to NJDEP, WCC never complied with the order and never paid the penalty.

From March 27-29, 1990, NJDEP reinspected the facility and again found many RCRA violations. As a result, NJDEP issued NOVs under the New Jersey Spill Prevention, Compensation and Control (SPCC) Act and ordered WCC to immediately remediate all spills and other violations. WCC never complied with the NOVs. On May 8, 1990, NJDEP issued a Directive to WCC pursuant to the SPCC Act, to secure the perimeter of the facility, provide 24-hour security and stabilize the drums located on the premises. WCC never responded to the Directive.

A removal action was initiated at the Site by the NJDEP on May 15, 1990. In August 1990, after removing approximately 1,000 drums, NJDEP reached their project cost ceiling of $825,000 and were forced to suspend operations. The NJDEP subsequently requested that the USEPA undertake a removal action at the Site.

NJDEP file photographs from WCC's Newark facility show a network of hoses leading from several buildings to a storm sewer in the northeast portion of the Site and to a drainage swale (leading offsite) in the vicinity of the railroad tracks. It was reported (NUS, 1990) that the storm sewer connects with a sanitary sewer that leads to a pumping station near the McClellen Street bridge and ultimately to the Passaic Valley Sewerage Treatment Plant on Newark Bay (a distance of approximately three miles). It should be noted that no storm sewers could be located on the Site during the RI investigation.

1.3.2 USEPA Removal Actions

On September 7, 1990, the USEPA performed a preliminary assessment (PA) of the WCC facility and found numerous air and water-reactive substances in 55-gallon drums (NUS, 1990). Numerous other RCRA violations were discovered. Approximately 10,900 55-gallon drums of hazardous substances were precariously stacked or improperly stored throughout the Site. Drums and other containers were found in various stages of deterioration, fuming and leaking their contents onto the soil. Numerous stains were observed on the soil. Other containers that were found on the Site included approximately 150 gas cylinders, 126 storage tanks, vats and process reactors, hundreds of fiberpack drums, glass and plastic bottles, carboys, boxes, and approximately 18,000 laboratory-type containers. The on-site laboratory contained thousands of unsegregated laboratory chemicals in deteriorating containers. These containers

were haphazardly stored on structurally unsound shelving, or stacked in piles on the floor.

The USEPA overpacked 11 fuming drums and secured them for future handling. A total of 4,200 empty drums were shipped off-site for disposal and approximately 6,700 drums were staged on-site for later characterization and disposal. The contents of most drums could not be identified because of poor, improper, or multiple labeling.

In 1990, the Technical Assistance Team (TAT) reported that five SARA Title III extremely hazardous substances (EHS) were present on the Site. The five EHS's, which were contained in drums and tanks, included allyl alcohol, bromine, chlorine, red phosphorous and phosphorous trichloride. The abbreviations used to quantify the amount of each EHS could not be interpreted with any certainty. The location of each EHS was cross-referenced to an area designation; however, a site map showing the location of each area could not be located.

In September 1990, the USEPA issued a Unilateral Administrative Order (UAO) barring WCC from continuing on-site operations and ordering evacuation of all personnel. In October 1990, the U.S. District Court for the District of New Jersey issued an order enforcing the USEPA's UAO. In November 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) issued a health consultation that concluded that the Site posed an imminent and substantial health and safety threat to nearby residents and workers. A Public Health Advisory was issued in November 1990.

In October 1990, the USEPA performed supplementary assessments at the Site including the laboratory. Thousands of small jars, bags, bottles and other vessels discovered in the laboratory contained flammable liquids, corrosives, acids, oxidizers, shock-sensitive material and air/water-reactive substances. In early 1991, the USEPA prepared a Focused Feasibility Study (FFS) to identify and evaluate remedial alternatives for an early remedial response. An early remedial response was necessary to respond to the imminent threat that was present on the Site. The FFS focused on aboveground containers that either posed an immediate threat or may have been a source of contamination.

Based on the known contamination at the property, the USEPA proposed the Site for inclusion on the National Priorities List (NPL) on May 9, 1991, and the Site was listed on September 25, 1991. The record of decision (ROD), which was issued on September 26, 1991, required appropriate security measures, stabilization of the Site, on-site treatment or neutralization of contaminated material, off-site treatment, recycling or disposal of contaminated material, decontamination and off-site disposal or recycling of empty drums and containers, decontamination of on-site storage tanks and process piping, and appropriate environmental monitoring.

1.3.3 Potentially Responsible Party Removal Actions

In 1992, the USEPA issued a UAO to a group of potentially responsible parties (PRPs) to remove 7,900 drums, the contents of more than 100 tanks, approximately 12,500 laboratory chemical containers, approximately 50,000 gallons of liquid contained in process tanks, and 14 gas cylinders, and to empty and clean process tank piping. Only three PRPs complied with USEPA's UAO. The PRP group completed their action on March 3, 1993.

1.3.4 Previous Environmental Investigations

In 1998, the USEPA Environmental Response Team (ERT) conducted a soil and building material investigation at the Site. The investigation was divided into two phases; Phase I

occurred in January 1998 and Phase II occurred in March 1998. During the Phase I investigation, 17 surface soil, three subsurface soil, two sump sediment, 15 wipe, five paint chip, and 16 asbestos samples were collected. The soil samples, which were all collected from unpaved areas at the Site, and the sediment samples, which were collected from sumps in the on-site buildings, were analyzed for dioxin, PBBs, and Target Analyte List (TAL) metals. Seven soil samples and the two sediment samples were also analyzed for SVOCs and the three subsurface soil samples were analyzed for VOCs. The VOC, SVOC and metal concentrations detected were compared to NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) to determine if the contaminants were present at levels that exceeded the standards. There are no NRDCSCC values for dioxin. The analytical results for the soil and sediment samples indicated the presence of three SVOCs (benzo(a)anthracene, benzo(k)fluoranthene, and benzo(a)pyrene) and five metals (antimony, beryllium, copper, lead, and thallium) at concentrations that exceeded the NJDEP NRDCSCC. PBBs (total) were detected in the surface soils/ sump sediments at concentrations ranging from 0.7 micrograms per kilogram (µg/kg) to 5,043 µg/kg [µg/kg are equivalent to nanograms per gram (ng/g)]. Twelve of those samples exceed the NJDEP NRDCSCC of 320 ng/g and ten samples exceed the USEPA Region 3 non-residential SSL of 640 ng/g. Dioxin was detected in all of the soil and sediment samples; however, the specific congeners present are unknown since all of the dioxin data was normalized to 2,3,7,8-tetrachlorodibenzodioxin (TCDD) using USEPA equivalency factors. The normalized dioxin concentrations ranged from 0.0007 µg/kg to 2.2059 µg/kg.

The wipe samples, which were collected from the Maintenance Shop, Boiler Room, and Building Nos. 33, 34, and 35, were analyzed for PBBs, total phenols, cyanide, and TAL metals. An area of 100 square inches was sampled for each wipe; one wipe was collected for each group of analytes (e.g., TAL metals). The weight of each wipe is unknown, therefore, it is not possible to convert the concentrations detected from µg/wipe to µg/kg. Analysis of the wipe samples indicated the presence of PBBs (up to 0.402 µg/wipe), total phenols (up to 0.0042 µg/wipe), and cyanide (up to 7.6 µg/wipe). Numerous TAL metals including antimony (up to 340 µg/wipe), arsenic (up to 17 µg/wipe), cadmium (up to 23 µg/wipe), chromium (up to 308 µg/wipe), copper (up to 1,030 µg/wipe), lead (up to 2,300 µg/wipe), mercury (up to 1.6 µg/wipe), thallium (up to 8 µg/wipe), vanadium (up to 142 µg/wipe), and zinc (up to 82,100 µg/wipe) were also detected.

Analysis of the paint chip samples indicated the presence of lead in all of the samples. The concentrations detected ranged from 10.8 milligrams per kilogram (mg/kg) to 1,670 mg/kg. Analysis of the asbestos samples indicated the presence of asbestos containing material (ACM) in all of the buildings sampled except Building No. 33.

During the Phase II investigation, 15 surface soil samples and 20 subsurface soil samples were collected from the Site using a Geoprobe® drill rig. The surface soils were all analyzed for dioxin, PBBs, polychlorinated biphenyls (PCBs), VOCs, SVOCs, and TAL metals while the 20 subsurface soils were analyzed for VOCs. The analytical results indicated the presence of four SVOCs (benzo(a)anthracene, benzo(k)fluoranthene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene) and two metals (lead and zinc) at concentrations that exceeded the NJDEP NRDCSCC. None of the samples had concentrations of VOCs or PCBs that exceeded the NJDEP standard. No PBBs were detected in any of these soil samples. Dioxin was detected at trace levels in the majority of the samples; the normalized dioxin concentrations ranged from 0.0069 µg/kg to 0.2259 µg/kg. A copy of the ERT report is presented in Appendix C.

The ERT investigation is the only known sampling activity to take place at the Site prior to the RI investigation. Limited air sampling was conducted prior to the drum removal; however, no subsequent air sampling is documented. The air sampling showed the presence of amines, sulfuric acid and VOCs.

A chronological summary of each major event in the Site history from 1983 - 2003 is presented in Table 1-1.

1.4 SUPERFUND REDEVELOPMENT INITIATIVE

The EPA's Superfund Redevelopment Initiative (SRI) was developed to help local governments participate in the cleanup and reuse of hazardous waste sites. A SRI Pilot Program was developed to help local governments enhance their involvement in predicting future land uses for Superfund sites. In July 2000, the City of Newark received a grant under this program to help return the Site to productive use. A community meeting held in August 2002 indicated that the community is interested in moving forward and that a developer was looking at redevelopment options for the Site. There is interest in possibly combining the Site with three adjoining properties to form a 15-acre parcel for redevelopment. The site lies within the Airport Support Zone which makes it an attractive property from a redevelopment standpoint.

1.5 FINAL RI REPORT ORGANIZATION

This Final RI Report is organized into three volumes. Volume I includes eight sections of text including executive summary, references, glossaries of abbreviations and acronyms, all tables, figures and 12 large plates. Volumes II and III include all appendices. A brief description of each section of text in Volume I follows.

Section 1.0, **INTRODUCTION,** presents a generalized overview of the Site (e.g., background, description, history, previous investigations) as well as a description of the purpose and organization of this Final RI Report.

Section 2.0, **STUDY AREA INVESTIGATIONS**, describes each major area of investigation (including surface features, surface and subsurface soils, sump sediment, groundwater, building materials, ecological and cultural resources) that was performed as part of this RI. Most of the field screening data (e.g., geophysical survey) that was collected during the initial phases of the field investigation and which guided subsequent activities (e.g., location of test pits, soil borings and monitoring wells) are described in this section.

Section 3.0, **PHYSICAL CHARACTERISTICS OF THE STUDY AREA,** utilizes historical data and information gathered during this RI to provide a general description of the physical characteristics of the surface features, meteorology, geology, soil, hydrogeology, demography and ecology (wetlands, fauna and flora).

Section 4.0, **NATURE AND EXTENT OF CONTAMINATION**, provides a summary and interpretation of the analytical results obtained during the RI.

TABLE 1-1
CHRONOLOGY OF EVENTS AND SITE INSPECTIONS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

DATE	EVENT
1983	WCC moves operations from Bayonne to Newark, NJ.
June - September 1989	NJDEP conducts site inspection and reinspection, and issues NOVs for drum leakage and improper drum storage.
October 1989	WCC initiates Chapter 11 bankruptcy proceeding.
March 15, 1990	NJDEP issues Administrative Order to correct hazardous conditions. A penalty is assessed for non-compliance and new NOVs are issued under the Spill Act.
May 8, 1990	NJDEP issues a Directive to WCC to secure the perimeter of the site, provide 24-hour security and stabilize the drums.
May 15 - August 1990	NJDEP initiates removal actions to stabilize the site. Operations are suspended when authorized funds ($825,000) are exhausted. NJDEP requests the USEPA to undertake a removal action.
July 1990	WCC ceases operations.
September 7, 1990	USEPA performs preliminary assessment.
October 1990	USEPA performs supplementary assessments and initiates removal actions.
November 1990	ATSDR issues a Public Health Advisory.
May 1991	USEPA proposes the site for inclusion on the NPL while continuing removal and stabilization activities.
June 1991	USEPA completes FFS.
September 25, 1991	Site is added to NPL.
September 26-27, 1991	A ROD was signed which provided for an interim remedial action at an estimated cost of $22,096,000. USEPA initiates interim remedial action.
March 31, 1992	USEPA issues a UAO, Index No. II CERCLA-20103 to ten companies and one individual to perform a response action.
October 29, 1992	PRP group initiates response action at the site under the UAO.
March 1993	PRP group completes response action and issues Final Report - Response Action.
January - March 1998	USEPA ERT conducts a soil and building material investigation at the Site.
October 1998 - July 1999	Malcolm Pirnie conducts an RI investigation at the Site.
April 2003	Malcolm Pirnie submits Final RI and RA Reports.

Section 5.0, **FATE AND TRANSPORT**, provides a general and site-specific discussion of contaminant fate and transport processes.

Section 6.0, **SUMMARY**, summarizes the discussions provided in previous sections.

Section 7.0, **REFERENCES,** provides a listing of the references cited in this report.

Section 8.0, **GLOSSARY**, provides a glossary of abbreviations and acronyms.

2.0 STUDY AREA INVESTIGATIONS

This section describes the methods and procedures used to complete the field work associated with this RI. Detailed descriptions of each individual sampling protocol can be found in the FSP (Malcolm Pirnie, 1998b). Key sampling protocols are summarized below.

2.1 SURFACE FEATURES INVESTIGATION

2.1.1 Topographic Mapping

An aerial flyover was conducted in February 1999 to develop aerial photographs of the Site and surrounding area. These aerial photographs were used to prepare a topographic base map of the Site at a scale of one inch equals 60 feet (1" = 60') with one-foot contour intervals. The location of horizontal and vertical control points and the elevation of plotted contours were verified in the field in February 1999. The Site Base Map, presented in Plate 1, shows significant physical features such as roads, buildings, fence lines, rail lines, and aboveground tanks. This base map was used to prepare the constituent distribution and groundwater flow maps presented throughout this report.

2.1.2 Surveying

Surveying of newly installed monitoring wells, soil borings, test pits, surface soil and sediment sampling points was performed in February 1999. Horizontal control points were based on New Jersey State Plane Coordinates (North American Datum (NAD) 1983) using control point KV6832 and one Global Positioning System (GPS) control point (575602.7966 (E), 680023.5149 (N)) established in the field. Vertical control was based on National Geodetic Vertical Datum (NGVD 1929) using vertical control point KV6832. The vertical accuracy for the inner and outer monitoring well casings is ±0.01 foot and the vertical accuracy for the ground surface elevations is ±0.1 foot. The location of all sampling points is presented in Plate 2.

2.1.3 Debris Removal

2.1.3.1 General

At the beginning of the field investigation (October 1998), a majority of the walkways, driveways, open areas, and areas adjacent to, and inside many buildings on the Site were strewn with a variety of general debris and trash (e.g., scrap lumber, asphalt roofing shingles, construction debris, automobile body parts, tires). The debris represented a physical safety hazard to the field investigation team and also blocked access to many areas where field investigation activities (e.g., geophysical surveys, soil borings, and surface soil sampling) were planned.

In preparation for the removal of this material, eight samples of roofing shingle debris were collected on October 22, 1998 for asbestos analysis using polarized light microscopy (PLM), analytical method USEPA 600/R-93/116. Analysis of the samples did not indicate the presence of any ACM. On October 26, 1998, the debris was segregated (e.g., tires, glass, potentially hazardous) and on October 28, 1998, removal of non-hazardous debris was initiated.

During the segregation activities, one fuming drum and one leaking drum were found and over packed. The fuming drum was located in the pile behind Building No. 33 and the leaking drum was located in the pile northeast of Building No. 34. In addition, other potentially

hazardous liquids, sludges, and solids (in various containers) were also found during debris removal operations. These containers were temporarily staged on the southeast portion of the Site in a specially constructed storage area for characterization sampling and later disposal.

On November 6, 1998, the potentially hazardous materials were further segregated based on the types of material they contained, and all like-materials were composited into common waste streams. Altogether, the material was separated into 21 types of waste streams based on their properties (e.g., physical state, color, odor, consistency, viscosity), and one sample was collected from each waste type. Two samples (paint-like material) were analyzed for lead and RCRA characteristics (pH, flashpoint, and reactivity), four samples (oily wastes) were analyzed for PCBs and RCRA characteristics, and 15 samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) parameters, RCRA characteristics, and PCBs.

The majority of the debris removed (3,165 cubic yards) from the Site was non-hazardous; however, a total of 22 drums containing both hazardous and non-hazardous liquids, sludges, and solids were shipped off-site for disposal. Debris that was present in locations that would not affect RI/FS activities was left in place. Copies of all hazardous and non-hazardous waste manifests are presented in Appendix D.

2.1.3.2 Bromine Release

During the debris removal activities, a heavy cast iron container was discovered under a debris pile located in a ditch formed by the railroad spur that enters the southern perimeter of the Site. In attempting to move the container, a small amount of an unknown liquid (less than one gallon) spilled from the container onto the asphalt. Soil was immediately placed over the affected area. Since only a minimal quantity spilled, notification of the release was not necessary. Due to the difficulty in moving the container and due to the unknown contents, it was left in-place and upright for later sampling.

On November 19, 1998, a representative from the debris removal subcontractor arrived on-site to collect a waste sample from the container for disposal purposes. While inspecting the tank, it was observed that the tank had apparently been upended and was leaking its contents onto the ground surface. A fork lift was used to upright the tank in order to stop the leaking. During this, it was observed that red vapors with a pungent nitric acid-like odor were coming from the tank. Soil was immediately placed over the spill area to damp the vapors, the opening in the container was plugged with inert materials, and all non-essential personnel were evacuated from the Site. Two Malcolm Pirnie personnel and the debris removal subcontractor representative remained on-site to oversee the response actions. The Site security guard was positioned in the parking area along Frelinghuysen Avenue (upwind of the spill area) to prevent site entry by unauthorized personnel.

As soon as the release was discovered, the appropriate authorities (i.e., NJDEP Spill Hotline (Case No. 98-11-19-1201-05), the USEPA's National Response Center (Report No. 464685), the Newark Emergency Management Office, the USEPA Work Assignment Manager (WAM), and the Newark police and fire departments) were notified. During this time, Malcolm Pirnie's subcontractor mobilized emergency response personnel to the Site.

Initially, based on visual observations, the material in the container was identified as fuming red nitric acid. However, during hazcat testing, the material exhibited two properties that were inconsistent with nitric acid; the material was non-soluble in water and the material turned the pH paper black. Subsequently, it was tentatively identified as bromine. Further laboratory

analysis confirmed this identification.

Investigation of the container indicated that it was a bullet-shaped vessel constructed of heavy cast iron with a glass lining and glass tubes running from one end to the other. It appeared to be a process vessel, with specialized fittings for a fork lift on the base of the container. It also appeared that the material had leaked from a rusted flange. The total volume of the container was estimated at 40 gallons.

The day after the spill was discovered, an emergency response team drained the remaining contents of the vessel (approximately five gallons) into a drum. The vessel was tripled rinsed, and the rinse water was also placed into the drum. The response team then began excavating in the spill area; however, the excavation was immediately stopped since red fumes began emerging from the soil. The soil was left in place and covered with clean fill and plastic.

The USEPA emergency response team was subsequently mobilized to the Site to excavate and remove the soil in the spill area. While awaiting the sampling results, all excavated soil was staged in a lined and covered roll-off dumpster. Once the analytical data was obtained, the soil and drummed liquids were removed to a disposal facility. The total amount released was estimated by USEPA Removal Branch personnel to be five gallons.

2.2 SURFACE AND SUBSURFACE SOIL INVESTIGATION

2.2.1 Geophysical Surveys

A geophysical survey was conducted at the Site between November 9 - 13, 1998 using magnetic, electromagnetic induction (EM), and ground penetrating radar (GPR). The geophysical survey was conducted to determine the presence of subsurface structures which would affect the location of the test pits and borings. This results of these surveys are not completely representative of subsurface conditions across the entire survey area.

The magnetic survey was conducted using a Geometrics Model G858 cesium magnetometer. The instrument, which was attached to a six-foot aluminum rod, records total magnetic field measurements to a data logger. Total field measurements were collected with the pole oriented horizontally and the sensor pointing north. Magnetic surveys were conducted on the north and south portions of the Site using a standard ten-foot grid. Measurements were collected every 20 feet along the grid. To ensure that representative data was collected during the survey, a base station was set up to measure diurnal variations (resulting from magnetic storms, temporal variations in the magnetic field, etc.) in the earth's magnetic field. These base station readings were used to remove the residual anomalies from the resultant data.

The electromagnetic survey was conducted using an EM-31 terrain conductivity meter. The EM-31 has a fixed intercoil spacing of 12.13 feet, with an effective depth of penetration of 20 feet below ground surface (bgs). The survey was conducted using the same grid used for the magnetometer survey. Due to the presence of fences, buildings, and railroad tracks, data was only collected along three traverses of the magnetometer survey grid. The three traverses (east to west) were conducted on the northern and southern portions of the Site. The north traverses initiated along the 100, 0, and 40 easting lines, and the south traverses initiated along the 20, 100, and 220 easting lines.

The GPR survey was conducted using a RAMAC GPR unit with a 200-Megahertz (MHZ) antenna. Under reasonable subsurface conditions such as low soil moisture and clay content, this antenna is capable of penetrating up to 20 feet bgs. In accordance with the Work

Plan, eight traverses were completed from the north, west, and south between Building Nos. 34, 35, and 36, and around the AST areas. All longitudinal traverses were initiated from the north, with the exception of T-7B and T-1, and all latitudinal traverses were initiated from the west. T-7B was initiated from the south and T-1 was initiated from both the north and south. The geophysical survey results are discussed below. The surface geophysical investigation report showing the traverse locations is presented in Appendix E.

2.2.2 Geophysical Survey Results

2.2.2.1 Magnetometer

The magnetometer data was evaluated using two methods; (1) magnetic anomalies were plotted against distance to generate a two dimensional geologic model, and (2) the data were plotted in plan view using the modeling program SURFER. The profile method allows the data to be viewed two dimensionally, which helps to determine the cause of the anomaly. The SURFER model illustrates the dimensions of the anomalies on a site wide basis.

North Yard

Six magnetic anomalies of unknown origin, which were presumed to be attributable to buried subsurface structures, were identified in the North Yard. All of these anomalies encompassed a single grid point and were visible using the profile method. Only four anomalies were visible using the SURFER model. The strongest magnetic anomaly was measured in the east-central portion of the yard at grid point 10 east, 10 north. However, this anomaly may be attributed to the fenceline separating the North and South Yards. The remaining anomalies varied in intensity and were well distributed throughout the North Yard. Diurnal measurements collected during the survey indicated that variations in the magnetic readings were not related to temporal influences.

South Yard

Six magnetic anomalies of unknown origin, which are presumed to be attributable to buried subsurface structures, were identified in the South Yard. The strongest magnetic anomalies were measured at 20 east, 30 north, and 80 east, 200 north. The remaining anomalies varied in intensity and were primarily found in the southern corner of the South Yard. Diurnal measurements collected during the survey indicated that variations in magnetic readings were negligible.

2.2.2.2 Electromagnetic Induction

North Yard

Conductivity data was collected along two survey lines in the North Yard. Less stable readings were encountered where site structures such as fences and buildings were present. Additionally, readings measured adjacent to the railroad tracks became less stable due to overhead high voltage lines, which run parallel to the tracks. The most significant fluctuations in measurements were observed in the southeast corner of the property adjacent to the tracks.

South Yard

Conductivity data were collected along three survey lines. Overhead high voltage lines along the east portion of the South Yard caused severe fluctuations in measurements and even

greater instability than that of the North Yard; therefore, data collected along one line was not sufficiently stable for reasonable analysis. No anomalous measurements were noted.

2.2.2.3 Ground Penetrating Radar

The GPR survey consisted of seven traverses (T1 through T7) between Building Nos. 34, 35, and 36, and the AST area. The results from the GPR survey were used to define the depth and dimension of the subsurface anomalies found during the magnetometer and EM surveys. The dimensions of the anomalies found during the survey are described further in the surface geophysical investigation report contained in Appendix E.

Traverse One (T-1)

The T-1 traverse ran from north to south and south to north with anomalies measured at positions 8.2, 16.4, 29.5, and 39.4 feet from the north end of the traverse, and 1.5, 8.0, 24.7, and 54.7 feet along the south end of the traverse. All of the anomalies are less than three feet bgs, which suggests that the anomalies are consistent with the presence of buried utilities.

Traverse Two (T-2)

The T-2 traverse ran from west to east along the south side of Building No. 33. Anomalies were measured at positions 7.5, 40.3, and 98.4 feet from the west end of the traverse. Anomalies found at the 7.5 and 40.3 foot positions are consistent with the presence of buried utilities. The third anomaly is deeper and wider, but the identity of the anomaly is not known.

Traverse Three (T-3)

The T-3 traverse ran from north to south from the west end of Building No. 35 to the west end of Building No. 34. Anomalies were measured at 4 to 23, 34.3, 47.9, 114.8, and 131.2 feet. With the exception of the anomalies found at 4 to 23, and 131.2 (18.8 feet wide, and 7.5 feet wide, respectively), the anomalies found at the three remaining positions are consistent with the presence of buried utilities. The anomaly found at the 4 to 23 foot position is consistent with an anomaly found at T-2.

Traverse Four (T-4)

The T-4 traverse ran from west to east along the north side of Building No. 35. Anomalies were measured at the 28.3, 42.6, 59.7, 113.1, and 155.6 foot positions. With the exception of the anomaly found at 28.3 feet, the anomalies found at the four remaining positions are consistent with the presence of buried utilities. The anomaly found at 28.3 feet is approximately 6.6 feet wide and does not appear to be consistent with the dimensions of the Building No. 34 tunnel.

Traverse Five (T-5)

The T-5 traverse ran from west to east along the south side of Building No. 35. Anomalies were measured at positions 39.4, 83.3, 101.7, 113.6, 142.7, and 180.4 feet from the west end of the traverse. With the exception of the anomalies found at 39.4, 142.7, and 180.4 feet, the anomalies found at the three remaining positions indicate the presence of buried utilities. The anomaly found at 39.4 feet is approximately 24.6 feet wide and is consistent with the dimensions of the Building No. 34 tunnel.

Traverse Six (T-6)

The T-6 traverse ran from west to east from Building 33 to an opening in the AST area. Anomalies were measured at positions 9.2, 30.5, 37.4, and 58.7 feet from the west end of the traverse. With the exception of the anomaly found at 37.4 feet, the anomalies found at the three remaining positions indicate the presence of buried utilities. The anomaly found at 37.4 feet is approximately 4.6 feet bgs and is consistent with the dimensions of the Building No. 34 tunnel.

Traverse Seven A and B (T-7A and T-7B)

The T-7A traverse ran from north to south from the east side of Building No. 34 to the railroad siding that terminates east of the maintenance shop. Anomalies were measured at positions 6.9, 13.4, 30.0, and 34.0 feet from the north end of the traverse. With the exception of the anomaly found at 13.4 feet, the anomalies found at the three remaining positions are consistent with the presence of buried utilities. The anomaly found at 13.4 feet is approximately 4.6 feet wide and potentially could be a buried structure or UST.

The T-7B traverse ran from south to north from the road between Building No. 35 into the area east of the maintenance shop. Anomalies were measured at positions 3.7, 13.0, and 27.0 feet from the south end of the traverse. All three anomalies are consistent with the presence of buried utilities.

2.2.3 Test Pits

Test pit excavation was the first intrusive activity that was initiated after the bromine release described above in Section 2.1.3.2. The discovery of the bromine liquid on the Site prompted Malcolm Pirnie to re-examine health and safety procedures before proceeding with the RI field investigation. Based on the re-evaluation, the decision was made to upgrade to Level B protection during the test pit excavations. Observations made during the test pit excavations were then used to ultimately determine the level of protection (maintain Level B or downgrade) used during the remainder of the field investigation. Since no buried objects were uncovered, the level of personal protection used for the remaining intrusive activities was downgraded to modified Level D, as was originally planned in the Safety and Health Plan (Malcolm Pirnie, 1998d).

Six test pits (TP-01 through TP-06) were excavated on the northern and eastern portions of the Site between December 7-11, 1998. The test pits were either located in former drum storage/tank areas (TP-01, TP-02, and TP-06), in an area where free product was detected in a soil sampling location (TP-03), or were located over magnetic anomalies discovered during the geophysical surveys (TP-04; grid node 40 north, 10 east and TP-05; grid node 110 north, -30 east). The objective of the test pit excavations was to determine if buried waste was present on the Site. The test pit locations are presented on Plate 2.

With the exception of TP-02, all of the test pits were located in a paved area. When the asphalt (or for TP-02, top one inch of soil) over the test pit location was removed, the opening was screened with a photoionization detector (PID) and detector tubes (nitric acid, phosphoric acid ester, hydrochloric acid, and hydrogen fluoride). In addition, the area was checked for magnetic anomalies with a metal detector. All of the detector tube and PID readings (from the opening of the test pit) were non-detect except for a PID reading of 2 to 3 parts per million (ppm) at the opening for TP-03. One slight magnetic anomaly was found over TP-05.

All of the test pits were excavated to the water table with depths ranging from nine feet

bgs (TP-02) to 12 feet bgs (TP-01). The test pits, which measured approximately 10 feet long by two feet wide, were excavated in one foot increments. As each one-foot increment was brought up, the soil was screened for volatile organics with a PID and visibly inspected for signs of contamination. A volatile organic sample was then immediately collected from the soil in the bucket in an area with elevated PID readings. If there were no elevated PID readings, the VOC samples were collected from the middle of the bucket. Additional soil was then collected directly from the bucket into a stainless steel bowl, which was covered with aluminum foil and allowed to off-gas for approximately one-half hour. A minimum of one sample was collected from each test pit from the sample interval exhibiting the highest off-gas readings. If no headspace VOCs were detected, the sample was collected from the first interval. All of the test pit samples were analyzed for Full Target Compound List (TCL)/TAL, including cyanide, total phenols, pH, total organic carbon (TOC), TCLP parameters, and PBBs. In addition, with the exception of TP-04, all of the samples were also analyzed for physical properties (moisture content, bulk density, atterberg limits or grain size).

After sampling was completed, all test pits except TP-06 were backfilled with the excavated material. Due to elevated PID readings and the presence of a solvent-like odor in the soil, TP-06 was backfilled with clean fill and the excavated soil was drummed for disposal. Test pit analytical data are discussed in Section 4.3.2. The test pit logs are presented in Appendix F.

2.2.4 Surface Soil Samples

Seventy-five surface soil samples (SS-1 through SS-9, SS-11 through SS-13, SS-15, SS-17 through SS-20, SS-24 through SS-33, SS-37, SS-40 through SS-46, SS-48 through SS-56, SS-58 through SS-63, and SS-65 through SS-89) were collected across the Site from December 4, 1998 through January 8, 1999. The locations of all the surface soil samples are shown on Plate 2.

A total of 90 sample locations were planned (81 specific locations and nine discretionary locations); however, due to Site conditions (e.g., perched groundwater, high water table, thick concrete pads, surface obstructions) only 75 samples were collected. The surficial soil sampling program was designed based on historical aerial photographs of the Site and guidance from the NJDEP Technical Requirements for Site Remediation (NJDEP, 1999). Soil samples were collected from former drum storage areas, along the edges of concrete pads that support ASTs, and in open areas. In addition, the locations of eight samples (SS-82 through SS-89) were discretionary and were selected in the field based on actual field observations or direct evidence of spills or stained soils. The purpose of the surface soil sampling was to characterize the nature and extent of contamination, identify source(s) of contamination, and provide a basis to assess the dermal/inhalation pathways associated with surface soil contaminants.

Eighty-one specific surface soil sample locations were identified in the Work Plan; 28 near the AST areas, 20 near the drum storage areas, 17 in open areas, two adjacent to a former swale, eight off-site locations adjacent to the Amtrak and Conrail right-of-way, and six in an on-site swale. A total of 56 surface soil samples were collected from the locations specified in the Work Plan. Nineteen samples (SS-1 through SS-3, SS-5 through SS-8, SS-11 through SS-13, SS-17 through SS-20, and SS-24 through SS-28) were collected to assess surficial soil contamination in the vicinity of the ASTs, 17 samples (SS-40, SS-42 through SS-46, SS-48 through SS-56, SS-58, and SS-59) were collected to assess surficial soil contamination in the former drum storage areas, 18 surface soil samples (SS-62 and SS-65 through SS-81) were

collected to assess surficial soil contamination in open areas on the Site, and two surface soil samples (SS-30 and SS-31) were collected to assess surficial soil contamination near a former swale. Nine locations near the ASTs could not be sampled either due to the thickness of the concrete pads (i.e., greater than 18 inches) or the presence of a high water table (at the time of sampling, a perched water table less than one foot bgs was present). Three locations in the drum storage areas could not be sampled due to the presence of a high water table and one sample could not be collected in an open area due to the presence of a large soil pile (residual clean fill from the bromine release).

None of the swale samples along the railroad sidings could be collected since the area was underlain by rock ballast. Attempts to auger or dig through the ballast were unsuccessful. Instead, one sample (SS-61) was collected adjacent to the swale. None of the off-site sampling locations adjacent to the Amtrak/Conrail right-of-way were sampled. After consultation with the USEPA WAM, it was decided to collect samples within the Site boundaries and as close to the right-of-way as possible, in lieu of off-site sampling. Four samples (SS-32, SS-33, SS-87 and SS-88) were collected at the Site boundary near the Amtrak/Conrail right-of-way.

The remaining surface soil sample locations were either discretionary or were moved from their original locations due to the reasons specified above. The samples that were relocated from the original locations include four samples (SS-4, SS-29, SS-60, and SS-63) that were moved to open areas, two samples (SS-9 and SS-15) that were moved to be near a location where free product was found, one sample (SS-37) that was moved to the walkway between Building No. 34 and the warehouse, and one sample (SS-41) that was moved to a location above the swale formed by the railroad spur. The discretionary samples include four samples (SS-83, SS-85, SS-86, and SS-89) located in open areas, one sample (SS-82) located near former ASTs, and one sample (SS-84) located behind Building No. 33 near a former debris pile.

Due to differing Site conditions, two methods were employed to access the soil at each sample location. At the majority of sample locations, the soil was covered with between six and 12 inches of impermeable asphalt and sub-base road bed materials. At these locations, an auger mounted on a drill rig was used to penetrate the asphalt and a decontaminated shovel and pick were used to clean the subbase from the road bed out of the hole. At locations not covered with impermeable materials, the top layer (< one inch) of soil was removed prior to sampling. Immediately after the hole was cleaned out or the top layer of soil was removed, the organic vapor levels were measured with a PID. A hand auger was then advanced twelve inches or until auger refusal. Immediately after the hand auger was removed, a VOC sample was collected using the methanol preservation method. The remaining soil was placed in a bowl, visibly inspected for staining, discoloration, or any other obvious signs of contamination, and homogenized prior to collection of the remaining parameters. The majority of the surface soil samples were collected from zero to 12 inches. Several samples were collected from shallower depths due to auger refusal, and several samples were collected below twelve inches in order to obtain sufficient sample volume. All samples were collected in accordance with the sampling procedures described in the FSP.

All of the surface soil samples were analyzed for Full TCL/TAL, including cyanide, total phenols, pH, and TOC. In addition, 11 samples (SS-3, SS-6, SS-12, SS-24, SS-37, SS-40, SS-44, SS-54, SS-71, SS-85, and SS-87) were also analyzed for TCLP parameters, PBBs, and dioxin. Surface soil analytical data are discussed in Section 4.3.1.

2.2.5 Shallow Soil Borings

2.2.5.1 On-Site

Thirty shallow soil borings (SB-1 through SB-30) were advanced on the Site between December 17, 1998 and January 28, 1999 to assess the presence, nature, and extent of contamination in the vadose zone, to define Site stratigraphy (presence or absence of tidal marsh deposits), and to install seven shallow monitoring wells. The borings were drilled to depths ranging from 23 to 24 feet bgs. The water table was encountered as high as six feet bgs and as deep as 14 feet bgs, but, in general, ranged from 10 to 12 feet bgs. The shallow soil boring logs are presented in Appendix G and the sample locations are presented on Plate 2.

Nine soil borings (SB-1, SB-7, SB-9 through SB-14, and SB-18) were advanced in or adjacent to former drum storage areas, six soil borings (SB-4, SB-24 through SB-26, SB-29, and SB-30) were advanced adjacent to or downgradient of AST areas, nine borings (SB-5, SB-8, SB-15 through SB-17, SB-19 through SB-21, and SB-27) were advanced in open areas on the Site, one boring (SB-2) was advanced near a former swale area, two borings (SB-3 and SB-6) were advanced adjacent to the on-site swale, one boring (SB-22) was advanced at the location of a former coal pile on-site, one boring (SB-23) was advanced near the sump in Building No. 34, and one boring (SB-28) was advanced near the sump in Building No. 33. Three borings (SB-24, SB-29, and SB-30) were moved from their original locations since those locations were not accessible by the drill rig.

During borehole advancement, continuous split-spoon samples were collected from the ground surface to the bottom of the boring; however, only soil samples collected above the water table were submitted for laboratory analyses. As each split-spoon was opened, the soil was screened for volatile organics with a PID and visibly inspected for signs of contamination. A volatile organic sample was then immediately collected from the soil in an area with elevated PID readings. If there were no elevated PID readings, the VOC samples were collected from the middle of the spoon. The remaining soil in the spoon was then collected directly into a stainless steel bowl which was covered with aluminum foil and allowed to off-gas for approximately one-half hour. In general, three samples from each boring were submitted for laboratory analysis; one from the first split-spoon (0 to 2 feet bgs for those samples installed in soil covered areas or 1 to 3 feet bgs for those samples collected in areas covered with impermeable materials), one from the spoon collected directly above the water table, and one from the interval that exhibited the highest off-gas reading. If no headspace VOCs were detected, the third sample was collected from the interval located halfway to the water table. Due to poor recovery and a high water table, respectively, only two chemical samples were collected from SB-22 and SB-23.

With the exception of four samples, all samples were analyzed for Full TCL/TAL, including cyanide, total phenols, pH, TOC, and cation exchange capacity (CEC). Due to poor recovery, SB-12-03, SB-22-01, SB-22-02, and SB-28-01 were only analyzed for Full TCL/TAL, including cyanide. In addition, 11 samples (SB-07-03, SB-08-02, SB-11-01, SB-13-01, SB-15-01, SB-16-01, SB-24-01, SB-24-03, SB-28-02, SB-29-01, and SB-30-01) were analyzed for PBBs and five samples (SB-08-01, SB-11-01, SB-13-01, SB-15-01, and SB-24-01) were analyzed for TCLP parameters. Samples were selected for PBB and TCLP analysis based on head-space readings and/or were collected from areas suspected to contain contamination. Seven samples (SB-04-04, SB-05-04, SB-07-04, SB-10-04, SB-18-04, SB-26-04, and SB-27-04) were also sent for analysis of various physical properties including moisture content, bulk density, atterberg limits or grain size. All samples were collected in accordance with the sampling

procedures described in the FSP. Shallow soil boring analytical data are discussed in Sections 4.3.1 and 4.3.2.

After sample collection, seven of the boreholes (SB-1, SB-7, SB-11, SB-17, SB-21, SB-22, and SB-25) were completed as monitoring wells (Refer to Section 2.3.1 below), while the remaining boreholes were sealed with cement grout.

2.2.5.2 Off-Site

Five soil samples were collected from four soil borings advanced in Weequahic Park on January 29, 1999 to characterize background soil quality. One of the borings (SB-31) was drilled to a depth of 12 feet bgs while the remaining three borings (SB-32, SB-33, and SB-34) were completed at a depth of five feet bgs. The off-site shallow soil boring logs are contained in Appendix G and the sample locations are shown on Plate 2.

During borehole advancement at SB-31, continuous split-spoon samples were collected from the ground surface to the top of the water table. Two samples were collected from SB-31 and were analyzed for Full TCL/TAL, including cyanide, total phenols, PBBs, and dioxin. During borehole advancement at SB-32 through SB-34, a hollow stem auger was used to drill to three feet bgs, and then a split-spoon sample was collected from three to five feet. These samples were analyzed for Full TAL, including cyanide. All samples were collected in accordance with the sampling procedures described in the FSP. Background soil data are discussed in Sections 4.2.3, 4.3.1, and 4.3.2.

2.2.6 Monitoring Well Borings

A total of eleven monitoring well borings were advanced on-site. Seven of the borings (see Sections 2.2.4.1 and 2.3.1.1) were shallow soil borings that were completed as monitoring wells. In addition, four pilot borings were drilled to determine the design and completion depth for the deep monitoring well wells. For details on these borings, refer to Section 2.3.1.2.

2.3 GROUNDWATER INVESTIGATION

2.3.1 Installation of Monitoring Wells

Eleven monitoring wells, seven shallow and four deep, were installed on the Site to assess the groundwater quality, obtain groundwater level elevations, determine the groundwater flow direction, and estimate the hydraulic characteristics of the aquifer. The wells were installed between January 6, 1999 and January 26, 1999. The locations of all the monitoring wells are shown on Plate 2.

2.3.1.1 Shallow Monitoring Wells

The shallow wells, MW-1S, MW-2, MW-3S, MW-4, MW-5S, MW-6, and MW-7S were installed in the shallow overburden deposits. All shallow monitoring wells were constructed with a ten-foot length of two-inch diameter, 10 slot, stainless steel screen with two-inch diameter stainless steel riser pipe. The riser pipe in each well extended approximately two to three feet above ground surface, except for MW-5S, which was flush-mounted. With the exception of MW-4, all the shallow wells were completed to a depth of 20 feet bgs[1]; MW-4 was completed

[1]The completion depth of the monitoring wells includes a one foot sump.

sediment in the bowls were then measured with a PID, and the sediment was visibly inspected for staining, discoloration, or any other obvious signs of contamination. Both samples were analyzed for Full TCL/TAL, including cyanide, total phenols, pH, TOC, TCLP parameters, PBBs, moisture content, and grain size. All samples were collected in accordance with the sampling procedures described in the FSP. The locations of the sump and floor drain sediment samples are shown on Plate 2. Sump and floor drain sediment analytical data are discussed in Section 4.3.3.

2.5.3 Storm Sewer/Sediment Investigation

The Work Plan identified four possible sediment samples to be collected from either storm sewers or surface water bodies since historical evidence indicated the presence of at least one storm sewer on the Site and intermittent water bodies were potentially present on the Site property. During the field investigation, the storm sewer in NJDEP file photographs could not be located and no surface water bodies existed from which to collect a sediment sample.

2.6 WEATHER AND TEMPERATURE MONITORING

During sampling activities, measurements were collected of wind speed and direction and temperature. A summary of the field meteorological measurements is presented in Appendix N.

2.7 ECOLOGICAL INVESTIGATIONS

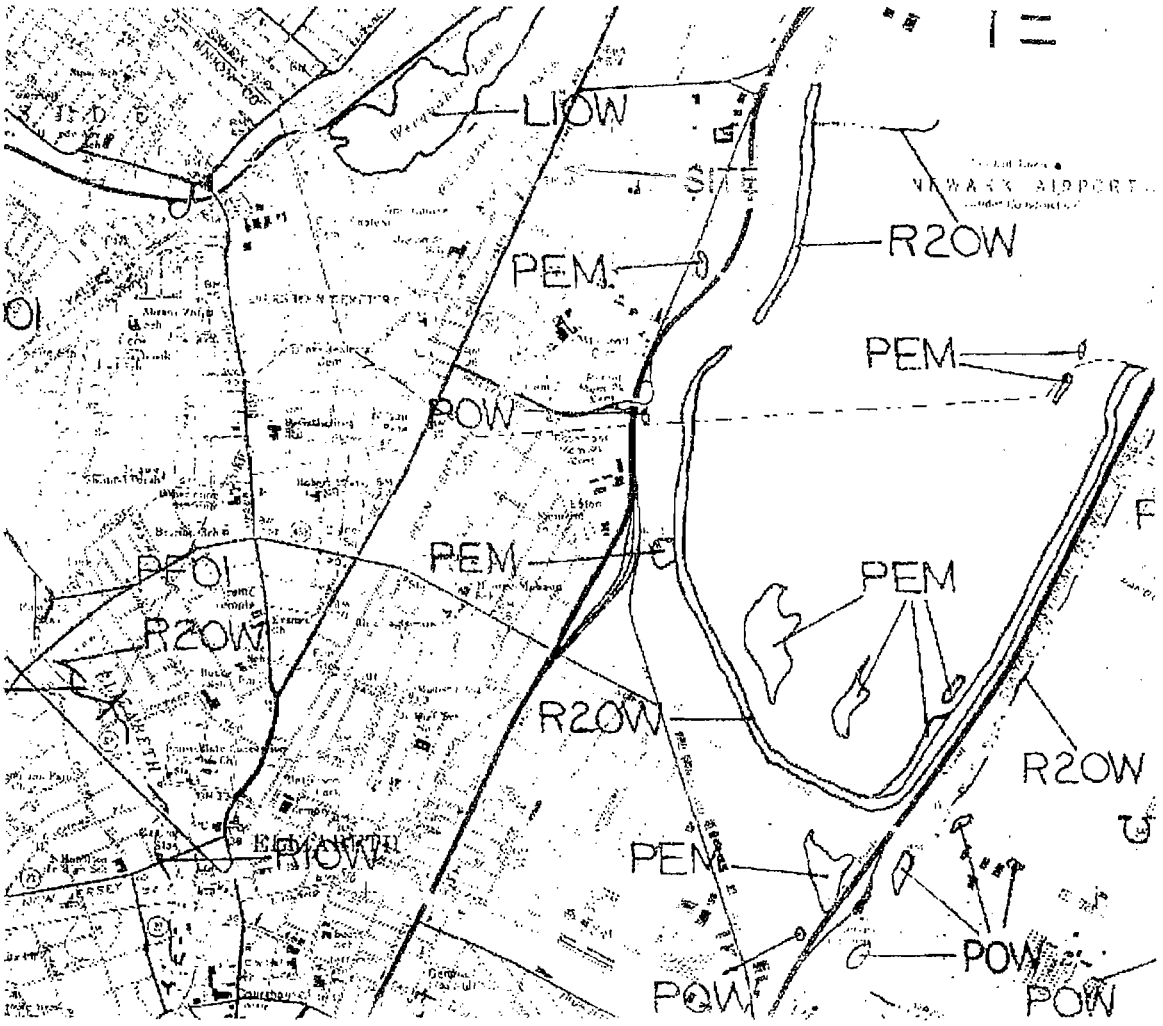
This section of the Final RI Report presents a discussion of the ecological resources present at the Site and in the vicinity of the Site. A screening-level ecological risk assessment to address the potential risks to wildlife receptors is presented in Chapter 3.0 of the Final Risk Assessment Report (Malcolm Pirnie, 2003).

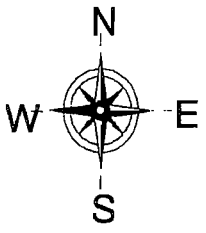
2.7.1 Surface Waters and Wetlands

Two surface water bodies are located in close proximity to the Site; Weequahic Lake, located west of the Site approximately 1,500 feet from Frelinghuysen Avenue and the Elizabeth River, located approximately two miles southwest of the Site. Newark Bay lies approximately three miles east of the Site. There are no direct surface water connections from the Site to any of these water bodies. Surface water ponds in several small areas on the property during periods of high rainfall; there are no channels conveying surface water runoff away from the Site.

No federally regulated wetlands are located within the Site boundaries. National Wetland Inventory (NWI) mapping (Elizabeth, NJ-NY quadrangle) for the Site and surrounding area indicates that Weequahic Lake is classified as L1OW (Lacustrine, Limnetic, Open Water). Other wetlands in the vicinity of the site are associated with either the Elizabeth River or drainage patterns within Newark Airport, as shown in Figure 2-1.

On March 26, 1999, a team of biologists conducted a reconnaissance of the Site to determine if any State regulated wetlands were present within the Site boundaries. All observations were recorded in a field logbook. The Routine On-site Determination Method in the 1989 Federal methodology, which requires the presence of hydrology, wetland soils and wetland vegetation, was used to evaluate the presence of wetlands. Based on application of this methodology, no wetlands were found on the Site. The following indicator categories were used





Legend:

L1OW	Lacustrine Limnetic Open Water
PEM	Palustrine Emergent
PFO1	Palustrine Forested Broad-leaved Deciduous
POW	Palustrine Open Water
R2OW	Riverine Lower Perennial Open Water

APPROXIMATE SCALE

Source: NWI Elizabeth, NJ-NY Quad, 1976

MALCOLM PIRNIE

WHITE CHEMICAL SITE
NEWARK, NEW JERSEY
NATIONAL WETLANDS INVENTORY MAP

MALCOLM PIRNIE, INC.

FIGURE 2-1

to classify the vegetation, based on the "National List of Plant Species that Occur in Wetlands: Northeast (Region 1)" (U.S. Fish and Wildlife Service (USFWS), 1988):

- **OBL:** Obligate Wetland species - Occur almost always under natural conditions in wetlands.
- **FACW:** Facultative Wetland species - Usually occur in wetlands, but occasionally found in nonwetlands.
- **FAC:** Facultative species - Equally likely to occur in wetlands or nonwetlands.
- **FACU:** Facultative Upland species - Usually occur in nonwetlands, but occasionally found in wetlands.
- **UPL:** Obligate Upland species - Occur in wetlands in another region, but occur almost always under natural conditions in nonwetlands in the region specified. If a species does not occur in wetlands in any region, it is not on the National List.

A plus (+) or minus (-) sign after the indicator indicates a frequency toward the higher (+) or lower (-) end of the category (more or less frequently found in wetlands).

Several small patches containing some typically hydrophytic vegetation exist within the Site boundaries. One patch is associated with the abandoned railroad spur at the southern corner of the Site. Vegetation in the railroad spur area (approximately 16 square feet) is composed of switch grass (*Panicum virgatum*), which is a FAC species and mugwort (*Artemisia vulgaris*), which is an upland species. The soil consists of broken asphalt and gravel/fill material which does not meet the criteria for a hydric soil. It is likely that the compacted fill material holds water at or near the surface for a period of time that allows facultative species to grow. However, given that several wetland/hydrophytic plants were observed in an area dominated by upland and facultative upland plants, and hydric soils were not present, the area does not meet the criteria for a wetland. All three wetland parameters must be present to classify an area as a wetland. A more extensive discussion of flora at the Site is contained in Section 2.7.2.

The second patch containing hydrophytic vegetation (approximately 65 square feet) is present near the center of the Site, just south of the maintenance building. Vegetation in this area consists of one wool grass (*Scirpus cyperinus*) plant (FACW+), two pussy willow (*Salix discolor*) saplings (FACW), four pin oak (*Quercus palustris*) saplings (FACW), eight cottonwood (*Populus deltoides*) saplings (FAC), and some rush (*Juncus sp.*) (usually FACW or OBL). Several nonwetland species were intermingled in this area including Japanese knotweed (*Polygonum cuspidatum*) (FACU-), mugwort (*Artemisia vulgaris*) (UPL) and fescue grass (*Festuca sp*) (usually FACU). The dominant vegetation in this area was less than 50% hydrophytic. The soil in this area also consists of broken asphalt and gravel/fill material and did not exhibit hydric characteristics at the time of the site reconnaissance. Due to the lack of hydric conditions and wetland soils in this area, it was not flagged as a wetland. A more extensive discussion of flora at the Site is contained in Section 2.7.2.

2.7.2 Flora and Fauna Inventory

On December 15, 1998, a field reconnaissance was conducted to assess the potential flora and fauna habitat present on the Site. The flora/fauna inventory was conducted using qualitative observations. The Site is located in an urban area, between Newark Airport to the east and Weequahic Park to the west. Land uses immediately surrounding the Site include commercial and industrial uses.

The majority of the Site consists of abandoned buildings and paved areas; however, some scrub/shrub type vegetation (approximately 10% of the Site), typical of disturbed urban areas, exists along the northern, eastern and southern borders. Vegetation in these areas includes tree/shrub species such as smooth sumac (*Rhus glabra*), cottonwood (*Populus deltoides*), sweet gum (*Liquidambar styraciflua*), pin oak (*Quercus palustris*), sycamore (*Platanus occidentalis*), pussy willow (*Salix discolor*), choke cherry (*Prunus virginiana*), American elm (*Ulmus americana*) and European buckthorn (*Rhamnus frangula*). Herbaceous species include poison ivy (*Toxicodendron radicans*), common reed (*Phragmites australis*), switch grass (*Panicum virgatum*), ragweed (*Ambrosia artemisiifolia*), aster (*Aster spp.*), and Japanese knotweed (*Polygonum cuspidatum*).

Wildlife use of the Site is expected to be minimal due to its limited size (4.4 acres) and disturbed nature, its location within an active urban area, and lack of diverse vegetation communities. The only wildlife observed during the December site visit were pigeons (*Columba livia*) and several sparrows (Family Emberizidae). Feral dogs have been observed on the Site during RI activities, and it is likely that mice and rats may utilize the Site as well. Duration of use by any wildlife species, in general, is expected to be sporadic since the Site offers limited habitat value.

2.7.3 Significant Habitat/Endangered Species

The New Jersey Natural Heritage Program (NHP) was contacted regarding the potential for threatened and/or endangered species to be present on the Site. According to the NHP (NJDEP, 1999), the Natural Heritage Data Base does not have any records for rare plants, animals or natural communities on the Site. Due to the lack of adequate habitat on the property, it is unlikely that threatened/endangered species would utilize the Site.

2.8 CULTURAL RESOURCES INVESTIGATION

2.8.1 Stage Ia Survey

A Stage Ia archaeological investigation of the Site was conducted in October 1998. The objectives of the study were the following:

- Determine the likelihood that possibly significant cultural resources were present within the Site;
- Preliminarily evaluate the architectural and historical significance of existing Site buildings; and
- Determine if any further archaeological investigations were necessary.

It was recommended that archaeological borings be advanced on the Site to determine whether any buried former ground surfaces are present, particularly beneath tidal or fresh water marsh deposits. These borings were not intended to test for the presence of cultural material but to determine the stratigraphy present and its potential for containing evidence of Native American occupation. No other recommendations were made in the Stage Ia report. The full text of the Stage Ia report (Malcolm Pirnie, 1998d) is presented in Appendix O.

The following observations were extracted from the Stage Ia report:

1) Buried marsh deposits and other former ground surfaces, which must be considered potential cultural-ecological deposits, may be preserved within the Site. Their initial appearance may date to one of the following periods: a) the period immediately after the draining of Glacial Lake Hackensack (circa (ca.) 12,500 before present (B.P.)) and the subsequent development of a marshy, grass and tree covered plain; b) the period when sea levels were rising (ca. 2,000 - 5,000 B.P.) and slowly affecting the Site vicinity; c) some period in between when conditions were right for marsh development within the area that now includes the Site property; or d) two or more of the above described time spans. These former surfaces could contain evidence of Native American activity associated with PaleoIndian and/or Archaic cultures. They also may have value for contributing to the scientific understanding of late Pleistocene and early Holocene environments in the Piedmont Lowland of New Jersey.

   In addition to such former ground surfaces potentially containing evidence of PaleoIndian and Archaic period activity, it is possible that Late Archaic, as well as post-Archaic, aboriginal cultures could have exploited any marshland environment formerly present in the Site vicinity. Native American sites likely would have formed on any small hills or rises that may have been a part of the local landscape. The current Site topography, however, bears little resemblance to the landscape characteristics of the area prior to filling and alluvial activity so the location of areas of formerly raised ground could not be determined for the Stage Ia report. Such areas of formerly raised ground could have been located anywhere within what is now the Site.

2) There are no Historic Period domestic or commercial/ industrial structures located within the Site. The nearest Historic period structures, two mid to late nineteenth century domestic residences, were located west of the Site fronting on Frelinghuysen Avenue. The distance of these former residences from the Site make it unlikely that structural remains, features, and/or deposits associated with their occupations would have extended into the western portion of the Site property. Additionally, that portion of the property has been extensively developed so even in the unlikely event that such remains did extend into the Site, ground disturbance associated with that construction likely would have disturbed any potential historic properties present. Accordingly, it is considered unlikely that historic period domestic or commercial/industrial historic properties are located within the Site and no further work designed to detect the presence of such resources is warranted.

3) None of the Site structures were potentially significant in terms of their architectural characteristics or the role they may have played in industrial history. All the buildings date to the mid to late twentieth century and appear to be of vernacular industrial style. Activities occurring within the structures reflect mid to late twentieth century technologies associated with the chemical industry. Accordingly, further architectural and/or industrial-historical evaluations of the Site buildings by a qualified architectural historian or industrial archaeologist are not considered to be warranted.

2.8.2 Stage Ib Survey

To satisfy the recommendations presented in the Stage Ia report, 30 continuous sample soil borings, advanced during the RI investigation, were archaeologically analyzed in April 1999. Indications of a buried organic peat-like layer and an underlying layer of gray silty clay, possibly representing a former ground surface, were found at one location (SB-24). The peat layer was found between two to eight feet bgs. This boring was located immediately north of the tank farm area. An extension of the former ground surface, although probably disturbed as a result of construction of a nearby building, was encountered in another boring (SB-30). This boring was located approximately 30 feet northeast of SB-24.

The borings at the Site apparently indicate that in one location (the vicinity of SB-24) a seemingly preserved former ground surface layer is intact below a buried peat-like deposit. Such a layer could potentially date to at least 2,000 years B.P.

Analysis of the remaining borings revealed only the presence of fill soils and naturally occurring deposits. None of those strata are considered to have potential archaeological value.

It was recommended that if extensive soil removal occurred in the vicinity of SB-24 as part of any required remedial activity at the Site, further archaeological investigations of that area should be conducted. The area for which further investigation is recommended extends a minimum of 50 feet in radius from SB-24 except in the direction of Building No. 34. In that direction, the zone of sensitivity extends no further than the vicinity of that building and its associated construction disturbance.

Alternatively, the Stage Ib report stated that if subsurface impact in the vicinity of SB-24 does not occur as a result of remedial activities at the Site, further archaeological investigation of that location would not be required. No other recommendations were presented in the Stage Ib report. The full text of the Stage Ib report (Malcolm Pirnie, 1999) is presented in Appendix P.

3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

3.1 SURFACE FEATURES

Surface elevations across the Site range from approximately 20 feet above mean sea level (MSL) in the western and central portions of the property to approximately 14 feet above MSL in the southern portion of the property. The Site and immediate vicinity are generally flat and graded with a gentle easterly slope toward the railroad tracks. The majority of the Site is covered with asphalt pavement, concrete slab, or buildings. Five major buildings (Building Numbers 33, 34, 34A, 35 and 36) and three smaller, facility support buildings (Boiler Room, Pump House and Maintenance Shop) are present. A Decon Shed, erected during the USEPA removal action, is also present. Several ASTs are located in a tank farm on a concrete pad in the central portion of the Site and a railroad spur is located in the southeastern corner of the Site. There are no streams or surface water bodies present on the Site and surface drainage is generally poor. During periods of heavy precipitation, ponding occurs on some portions of the property.

3.2 METEOROLOGY/CLIMATE

The National Weather Service has characterized climatological conditions at Newark International Airport, which is located less than one mile east of the Site. The climate in the region is humid and is typified by moist, warm summers and moderately cold winters with wind of moderate velocity. Prevailing winds in the area are from the southwest, with only slight seasonal variations in direction, and are affected primarily by the influence of the Atlantic Ocean and the topography of the surrounding area.

The mean annual temperature measured at Newark Airport is 54.6° Fahrenheit (F). The maximum and minimum mean monthly temperatures are 77.3° F (July) and 31.7° F (January), respectively. The average annual precipitation is 43.47 inches. Monthly averages range from 3.00 inches in June to 4.38 inches in July. Summary tables of temperature and precipitation data are presented in Tables 3-1 and 3-2, respectively.

3.3 GEOLOGY

The following sections describe the regional geologic framework in the vicinity of the Site, as well as the Site-specific geology characterized during the RI activities.

3.3.1 Regional Geology

The Site is located in the Piedmont (Lowlands) Physiographic Province, which is characterized by gently sloping hills. The Lowlands are bounded by the Coastal Plain to the south and east, the New England Uplands to the north, and the Piedmont Uplands to the west. The geology of the region is characterized by unconsolidated sediments deposited on sedimentary bedrock of Triassic Age. The sedimentary bedrock consists of an arkosic shale which is reported to lie approximately 85 feet bgs (Nemickas, 1974). The unconsolidated sediments are typically composed of three strata: alluvium, tidal marsh deposits and glacial drift. The glacial drift is the deepest unit, which rests unconformably on the bedrock. The shallower tidal marsh deposits rest conformably on the glacial drift, while the alluvium rests conformably

TABLE 3-1
AVERAGE MEAN, MAXIMUM, AND MINIMUM TEMPERATURES AT NEWARK INTERNATIONAL AIRPORT
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

(Data Period 1948-1997)

Month	Mean (°F)	Maximum (°F)	Minimum (°F)
January	31.7	38.7	24.5
February	33.7	41.4	26.0
March	41.5	49.7	33.3
April	52.4	61.7	43.2
May	62.6	72.1	53.2
June	72.1	81.4	62.9
July	77.3	86.1	68.5
August	75.7	84.2	67.1
September	68.1	76.8	59.4
October	57.3	66.3	48.4
November	46.7	54.5	38.9
December	36.0	43.0	29.0
Annual	54.6	63.1	46.3

Reference: HYDRODATA, 1997

TABLE 3-2
PRECIPITATION DATA AT NEWARK INTERNATIONAL AIRPORT
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

(Data Period 1948-1997)
PRECIPITATION IN INCHES (Water Equivalent)

Month	Average	Maximum Monthly
January	3.37	10.1
February	3.02	4.94
March	4.14	11.14
April	3.77	11.14
May	3.83	10.22
June	3.00	6.4
July	4.38	9.98
August	4.04	11.84
September	3.48	9.0
October	3.07	6.92
November	3.73	11.53
December	3.60	9.47
Year	43.47	65.5

References: HYDRODATA, 1998
NOAA, 1983

on top of the tidal marsh deposits. The following paragraphs describe the geologic nature of the sedimentary bedrock and the overlying unconsolidated sediments. These formations will be discussed from oldest to youngest.

The Site is located in the Newark Basin, which extends southward from the Hudson River Valley in New York to southeastern Pennsylvania. A stratigraphic section of the Newark Basin is shown on Figure 3-1. The Newark Basin is primarily composed of a sequence of sedimentary rocks known as the Newark Group. It is a fluvial deposit lain down in the Triassic Period. The Newark Group is divided into three distinctive formations: the Stockton Formation, Lockatong Formation and Passaic Formation (oldest to youngest). In northern New Jersey, however, the Lockatong Formation is missing and the Passaic Formation directly overlies the Stockton Formation. The Passaic Formation ranges in thickness from 6,000 to 10,000 feet, and consists of non-marine shales, arkosic sandstones, conglomerates and intrusive igneous rocks (basalt and diabase). The Passaic Formation, which strikes north 50 degrees east and dips from nine to 12 degrees to the northwest, is a soft red shale located 85 feet below land surface (Nemickas, 1974). A description of the Stockton Formation is not included since it is located approximately 6,000-8,000 feet below the top of the Passaic Formation and therefore is not relevant to this investigation.

Two ridges, the First and Second Watchung Mountains, extend from northeast to southwest across Essex County. These are the two lowest sequences of basalt flows of the Watchung basalt. The third uppermost sequence of flows is represented by Ricker Hill in Livingston Township. These basalt sheets were formed by lava which was intruded into the Passaic at three different times during the accumulation of the sedimentary rocks.

Unconsolidated deposits of Pleistocene Age overlay the Passaic Formation across Newark. These sediments were deposited by glaciers and glacial meltwaters as ground moraine or stratified drift. Stratified drift is deposited by glacial meltwater in streams (glaciofluvial) or lakes (glaciolacustrine). Glaciofluvial deposits are generally stratified sand, and sand and gravel, and glaciolacustrine deposits are usually bedded or laminated silt and clay. Streams and rivers draining Essex County before the last glaciation cut deep valleys into the bedrock. These valleys were subsequently buried by glacial debris. The altitude of the floor of the buried bedrock valley under the Newark area is as much as 280 feet below sea level and the glacial drift is as much as 300 feet thick (Nichols, 1968). The thickness of the unconsolidated material is controlled by the underlying bedrock topography. The glacial deposits are approximately 60 feet thick in the vicinity of the Site (Nemickas, 1974).

The Pleistocene deposits are overlain by post-glacial tidal marsh deposits, lain down recently as a coastal wetland. Tidal marsh deposits are typically characterized by the presence of either a meadow mat or organic silt deposits. Meadow mat is composed of grass, roots, and other organic material tangled together to form a mat. Organic silt deposits, which often occur beneath the meadow mat, are composed of fine-grained organic silt laid down in still water bays and estuaries. These deposits are found mainly in the eastern part of Newark along the Passaic River and bordering Newark Bay (Herpers and Barksdale, 1951).

The tidal marsh deposits are typically covered by alluvium. Alluvium is a fluvial deposit lain down in recent times by the Passaic and Hackensack Rivers and by smaller streams flowing across the area. Unconsolidated sediments of Recent Age are confined to areas adjacent to present–day streams. These deposits consist of clay, silt, and fine sand with gravel (Rogers and others, 1957).

AGE	Stratigraphic Divisions		Symbol	Thickness (feet)
LOWER JURASSIC	Brunswick Group	Boonton Formation	Jb	1,500
		Hook Mountain Basalt	Jh	330
		Towaco Formation	Jt	1,020
		Preakness Basalt	Jp	750
		Feltville Formation	Jf	510
		Orange Mountain Basalt	Jo	450
		Passaic Formation	JTp Tp	10,000
UPPER TRIASSIC		Lockatong Formation	Tl	3,300
		Stockton Formation	Ts	5,400

Compiled from Olsen, 1980 and other sources.

MALCOLM PIRNIE

WHITE CHEMICAL SUPERFUND SITE
NEWARK, NEW JERSEY

NEWARK BASIN STRATIGRAPHY

MALCOLM PIRNIE, INC.

FIGURE 3-1

3.3.2 Site Geology

Thirty-four shallow soil borings and four deep pilot borings were advanced at various areas across the Site to collect information on the subsurface stratigraphy underlying the Site. Total depths of the borings ranged from approximately five feet bgs to 57 feet bgs. Boring logs compiled from on-site drilling activities are contained in Appendix G.

Lithologic descriptions presented on the boring logs indicate that the Site is predominantly underlain by deposits consisting of clayey silt and fine to coarse sand. Fill material was encountered across the Site, ranging in thickness from approximately two to ten feet. The fill consists mostly of silt with trace sand and gravel. Beneath the fill, clayey silt deposits ranging in thickness from approximately two to ten feet were encountered. These deposits are interpreted to be the alluvial deposits discussed above. A buried peat-like deposit was encountered in one location (SB-24) at a depth of 2 feet bgs. Beneath the alluvium, fine to course sand with varying amounts of silt and gravel was encountered with an occasional silt lens, ranging in thickness from approximately four to 40 feet. These deposits are interpreted to represent the Pleistocene glacial deposits discussed in Section 3.3.1. The weathered shale bedrock was encountered in three of the four deep pilot borings at depths ranging from 37 feet bgs to 55 feet bgs. Thickness of the weathered bedrock ranged from six to 10 feet. The surface of the bedrock is relatively flat in the northern portions of the Site (MW-5D to MW-3D), but dips to the east in the eastern portions of the Site (MW-7D to MW-3D) and to the south in the southern portions of the Site (MW-7D to MW-1D and MW-3D to MW-1D).

3.4 SOIL CHARACTERISTICS

Selected soil samples were analyzed for physical properties (i.e., grain size, bulk density, moisture content, and/or atterberg limits). The soil samples were collected from test pits and soil borings in both the saturated and unsaturated zones.

Grain size data suggest that the soils consist of poorly sorted gravel, sand, and silt and clay. The average grain size distribution of nine soil samples consisted of approximately 7 % gravel, 63 % sand, and 30% silt and clay.

The average soil bulk density estimated from 15 soil samples was 104 pounds per cubic foot. This value falls within the expected range for poorly sorted silty sands (Maidment, 1993). The plasticity index of four samples ranged from 6% to 9%. The remaining three samples were classified as non-plastic. The liquid limit and plastic limit ranged from 24% - 27% and 18% - 21%, respectively in the four samples. Sieve analysis distribution curves are contained in Appendix Q.

3.5 HYDROGEOLOGICAL CHARACTERISTICS

This section describes the occurrence of groundwater in the regional geologic framework described in Section 3.3.1, as well as Site-specific hydrogeologic characteristics.

3.5.1 Regional Hydrogeology

Groundwater in the Passaic Formation occurs under unconfined and confined conditions. Unconfined groundwater is found mainly in the upland areas, west of the Site, where the

unconsolidated deposits are thin or not present. Confined and semi-confined conditions exist in lowland areas, such as Newark, where clay beds in the unconsolidated glacial deposits mantle the underlying bedrock (Nichols, 1968). The Passaic Formation has practically no primary interstitial porosity. Secondary porosity, consisting of joints, bedding planes and fractures, reportedly produces groundwater yields of two to 660 gallons per minute (gpm), with an average yield of 75 gpm to a well (Anderson, 1968). Locally, the fractures may be widened by the percolating groundwater that dissolves minerals from the walls of the fractures. The size of the fractures, however, tend to decrease with depth as the weight of the overlying bedrock increases.

The Passaic Formation is a heterogeneous anisotropic aquifer; permeability can vary greatly with depth as well as with direction at any given location. Typically, the drawdown rate in an observation well is greatest when the observation and pumping wells are aligned parallel to the strike of the formation. Specific capacities of Passaic Formation wells range from 0.1 to 25 gpm per foot (gpm/ft) of drawdown and average 2.2 gpm/ft. The depths of wells in the Passaic Formation range from 60 to 1,566 feet with an average of 218 feet (Anderson, 1968).

The unconsolidated deposits of stratified and unstratified drift overlying the bedrock also contain groundwater. Groundwater in the glacial drift is likely to be confined if tidal marsh deposits are present. Based on the topography of the area, groundwater is assumed to flow to the east, discharging to either Newark Bay or the mosquito ditches that surround Newark International Airport. A glacial drift aquifer under the Rahway River reportedly has a hydraulic conductivity of 1,000 gallons per day per square foot. The coefficient of storage ranges from 0.1 to 0.2 (Anderson, 1968).

The tidal marsh deposits, where present, may act as a confining unit separating the glacial drift aquifer from the alluvial aquifer. Information about the vertical hydraulic conductivity and storativity of this material is not available.

3.5.2 Site Hydrogeology

Four synoptic rounds of water level measurements were collected on February 22, 1999, July 13, 1999, April 27, 2000 and October 17, 2000. Based on the data collected during the first three rounds, depth to groundwater in the shallow wells ranged from 9.37 to 12.64 feet bgs. Depth to groundwater in the deep wells ranged from 8.43 to 11.88 feet bgs. The water level measurements were used to estimate the horizontal component of groundwater flow beneath the Site. The conceptual groundwater flow in the upper water table on February 22, 1999, July 13, 1999, April 27, 2000, and October 17, 2000 are shown on Figures 3-2 through 3-5, respectively. The conceptual groundwater flow in the lower water table on February 22, 1999, July 13, 1999, April 27, 2000, and October 17, 2000 are shown on Figures 3-6 through 3-9, respectively.

The water level data indicate that shallow groundwater flow radiates away from a mound that exists in the vicinity of Building No. 34, thereby, creating a groundwater divide. Mounding of groundwater in the vicinity of Building No. 34 may be caused by the flooded tunnel that exists under this building. (Note: The only known access point to the tunnel is a stairway in the floor of Building No. 34 that is covered by a sheet of heavy plywood; the tunnel was flooded during each observation. The geophysical survey was unsuccessful in mapping the path of the tunnel, therefore, the termination point and alternate entry points to the tunnel are unknown). Shallow groundwater flow radiates away from the divide in the northern portions of the Site; south of the divide groundwater flows more uniformly to the south. This pattern was better defined in February and July 1999 and October 17, 2000 (Figures 3-2, 3-3 and Figure 3-5, respectively) and

less well defined in April 2000 (Figure 3-4) when the mound appears to extend further to the east. One explanation for the difference in April 2000 may be due to the fact that one critical water level measuring point (MW-4) is missing (lock could not be opened).

The groundwater divide is less evident at depth. The direction of deeper groundwater flow is fairly consistent with the shallow groundwater flow and follows the surface of the underlying bedrock. In the southern portions of the Site, the main component of groundwater flow at depth is to the south, with groundwater flow in the northern portion of the Site varying from northeasterly to southeasterly. This pattern is better defined in February 1999, April 2000 and October 2000 (Figures 3-6, 3-8 and Figure 3-9, respectively) and less well defined in July 1999 (Figure 3-7).

The average horizontal gradient across the Site is very flat (approximately 0.002 feet/foot). The contour interval of 0.2 feet was chosen to minimize exaggeration of the horizontal gradient; however, even an interval of 0.2 feet is relatively small. Any slight variation in water level significantly affects the direction of groundwater flow when the gradient is so flat. The variations that are present are attributed to seasonal variations or meteorological conditions. Neither the chemistry of the groundwater (e.g., hydraulic conductivity) nor physical observations (no water observed in the ditches along the Conrail and Amtrak rail tracks) reflect any evidence of tidal influences. Synoptic water level measurements in the four pairs of shallow and deep wells (MW-1S/1D, MW-3S/3D, MW-5S/5D and MW-7S/7D) indicate a downward vertical gradient across the Site. Seasonal fluctuations in water levels across the Site ranged from approximately 0.4 to one foot.

Slug tests were conducted on both the shallow and deep monitoring wells on March 4 and 5, 1999. Results indicated that the estimated hydraulic conductivity values in the shallow wells ranged from 8.7×10^{-4} cm/sec in MW-1S to 7.2×10^{-3} cm/sec in MW-5S. These values fall within the range of hydraulic conductivity values expected for a silty sand aquifer (Freeze and Cherry, 1979). The estimated hydraulic conductivity values in the deep wells ranged from 1.2×10^{-4} cm/sec in MW-5D to 1.8×10^{-3} cm/sec in MW-1D.

Groundwater flow velocities beneath the site were determined using the following information: geologic descriptions from samples collected during well installations; published porosity values; hydraulic conductivity values derived from slug test data; and hydraulic gradient value determined from the water level contour maps. Based on the boring logs, the Site is underlain by silty sand deposits overlying bedrock. A porosity value of 25 percent was selected from the literature (Freeze and Cherry, 1979) based on this description of the deposits. An average hydraulic gradient of 0.002 feet/foot was calculated using the contoured water-level data. Groundwater flow velocities were calculated using the following equation:

$$v=KI/n$$

where:

v	= groundwater velocity	(feet/year)
K	= hydraulic conductivity	(cm/second)
I	= hydraulic gradient	(feet/foot)
n	= porosity.	(dimensionless)

Using the values stated above and assuming an overburden porosity of 25 percent, the range of calculated groundwater velocities in the shallow groundwater is 7.3 to 58.4 feet per year and 1.1 to 15 feet per year in the deep groundwater.

3.5.3 Groundwater Use

A search for all wells located within a 1.5 mile radius of the Site was conducted in February 1999. The purpose of the well search was to identify, locate, and characterize any wells supplying water for domestic, commercial, public (i.e., hospitals and schools), industrial, or municipal use in the vicinity of the Site. As part of the characterization of these wells, data was compiled and evaluated on well depths, formations, well yields, and distances from the Site.

The well search was performed by accessing the database of well permits at the NJDEP Bureau of Water Allocation (BWA). The well search conducted by BWA included all permitted wells and soil borings that were installed within a 1.5-mile radius of the Site. As expected in an urban, industrial area, a large number of monitoring wells (460), contaminant recovery wells (15), and soil borings lie within the search radius around the Site. Other wells identified during the search included injection wells and gas vent wells. Nearly all of these wells were installed to support environmental remediation activities for other properties around the Site. These types of wells are not used for water supply, therefore, were not evaluated as part of this study.

Well records from the BWA indicate that 16 water supply wells lie within the 1.5 mile search radius. A summary of the well search and a figure showing the locations of the wells is presented in Appendix R. Only one of these sixteen wells is classified for domestic use. This well (Well No. 11) is located approximately 2,200 feet southeast of the Site on the eastern side of the railroad tracks and is screened 104 feet below grade in the unconsolidated glacial drift deposits. No information was available on the quality of water from this well.

The 15 remaining supply wells appear to be classified for industrial or commercial use. These wells range in depth from 180 to 910 feet below grade and are screened in the Brunswick Group (comprises the Passaic and other formations). Well No. 13 lies closest to the Site (1,300 feet) and is the deepest well. The production capacity of wells screened in the Brunswick ranges from 12 gpm to 150 gpm, with an average rate of 65 gpm. Because of their relatively poor specific capacity, wells screened in the Brunswick are often deepened by several hundred feet to provide extra storage in the well casing.

Eleven of the 16 wells were installed prior to 1970. Many of the local businesses identified in the well records are no longer located at these addresses. Although abandonment reports were not encountered in the well search data package from the BWA, many of the older wells are probably out of service, or have been abandoned. Five of the wells were installed after 1980, and appear to be part of active facilities. Based on this, pumping for water supply appears to continue in the area around the Site.

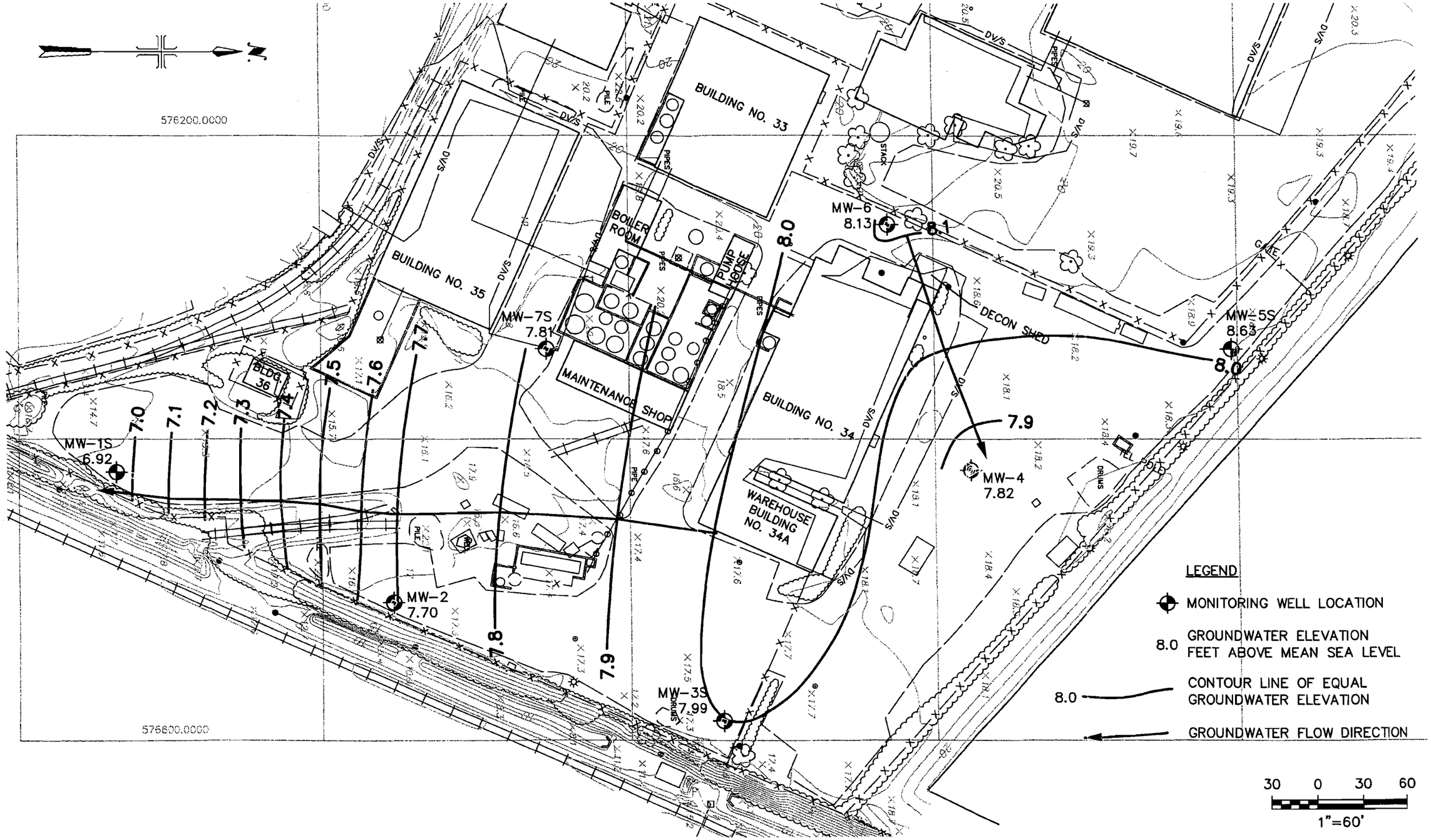
3.6 LAND USE AND DEMOGRAPHY

Land Use/Land Cover data for Essex County, New Jersey was downloaded from the NJDEP's Geographic Information System (GIS) data web page. This data uses the Anderson Classification system for categorizing land use and is current as of 1986. The City of Newark is an urban industrial center located on the eastern edge of Essex County. Land use on and immediately adjacent to the Site falls almost entirely within the Level I category of Urban or

Built-up land. The Level I Urban or Built-up Land category is characterized by intensive land use where the landscape has been altered by human activities. The Level I Urban or Built-up Land category is subdivided into several Level II categories including: Residential; Commercial and Service; Industrial; Transportation, Communication and Utilities; Industrial and Commercial Complexes; Mixed Urban or Built-up; Other Urban or Built-up; and Recreational. Predominant land use surrounding the Site is Industrial. The Industrial areas are interspersed with some Residential and some Commercial and Services to the southwest of the Site. Immediately to the west of the Site are Weequahic Lake and Weequahic County Park. There is some Recreational land west of Weequahic Park. Most of the area surrounding the park has a Level I category of Forest and a Level II category of Deciduous Forest.

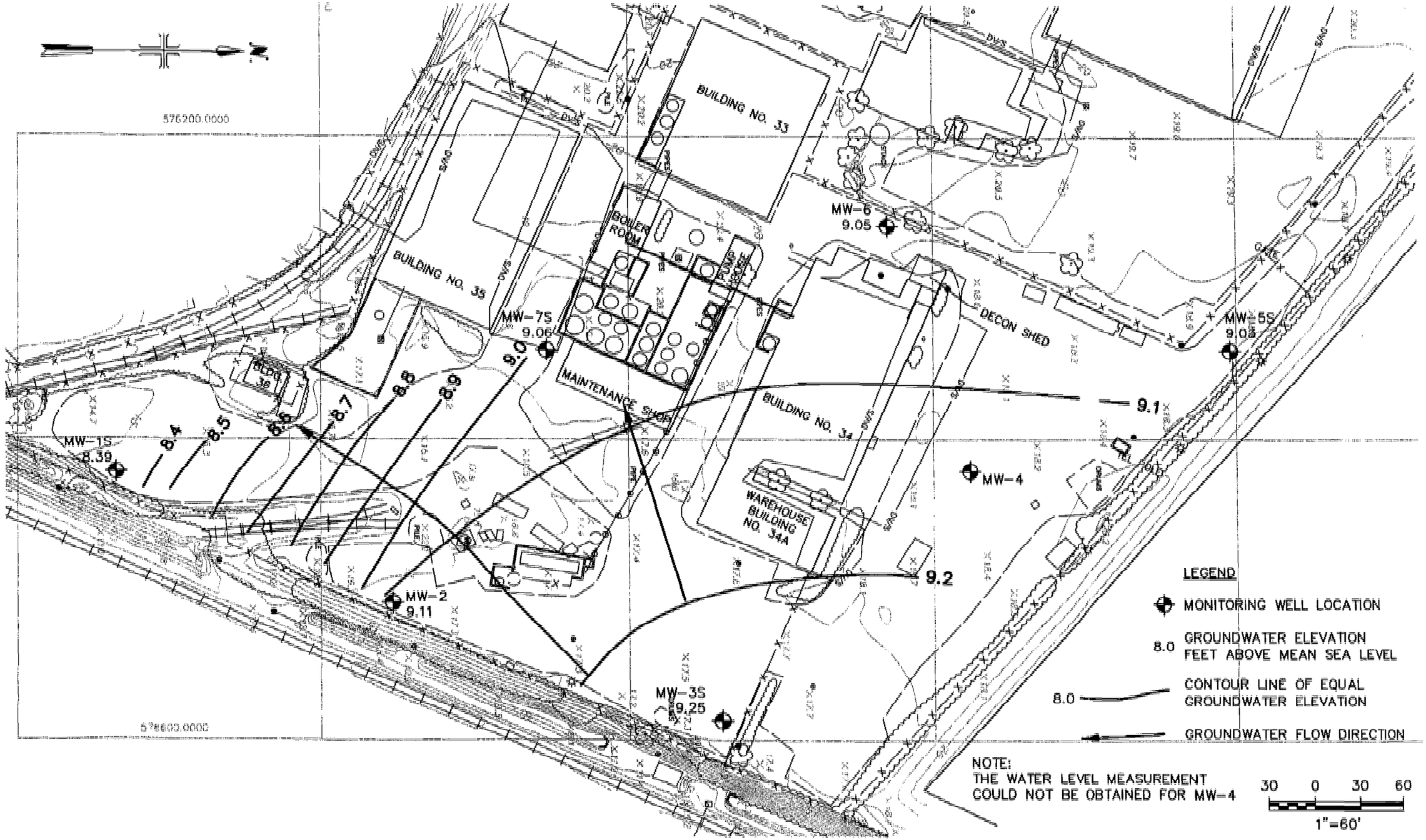
The Site is located in an area of Newark with an economically and ethnically mixed population. As of 1990, the City of Newark had a total population of 275,221 people (U.S. Department of Commerce, 1990). The city's population includes white (29 %), black (58 %), and American Indian, Asian and other racial and ethnic groups (13 %). Approximately 29 % of city residents are children under the age of 18 years, while individuals 65 years of age and older account for 9 % of the city's total population. Very young children (under the age of 5) make up approximately 8 % of the residential population. The level of income of area residents varies from the relatively wealthy to the very poor; a significant portion of the population lives at an income below the poverty level (U.S. Department of Commerce, 1990).

User: zumi Spec: PIRNIE STANDARD File: I: \ACAD\PROJ\30200040\Groundwater\dwg\...IGURES\GWCONT-FIG 3-3.DWG Scale: 1:1 Date: 04/10/2003 Time: 12:3S ...yout: Layout2

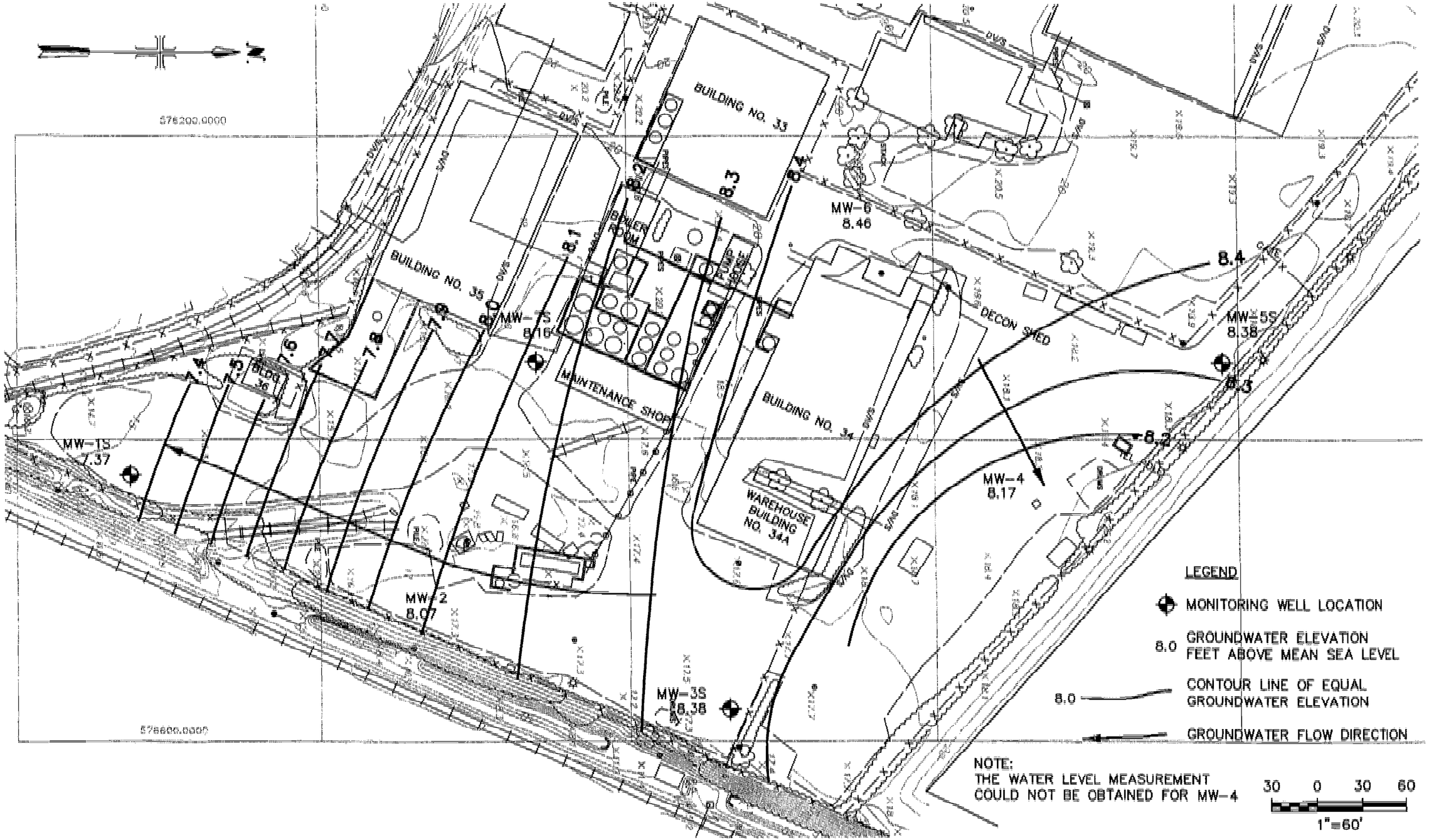


MALCOLM PIRNIE	WHITE CHEMICAL SUPERFUND SITE NEWARK, NEW JERSEY	CONCEPTUAL GROUNDWATER FLOW UPPER WATER TABLE – JULY 13, 1999	MALCOLM PIRNIE, INC. APRIL 2003 FIGURE 3–3

User: zumm Spec: PIRNIE STANDARD File: I:\ACAD\PROJ\30020040\Groundwater\dwg\...\FIGURES\GWCONT-FIG 3-4.DWG Scale: 1:1 Date: 04/10/2003 Time: 12: 36 Layout: Layout2



MALCOLM PIRNIE	WHITE CHEMICAL SUPERFUND SITE NEWARK, NEW JERSEY	CONCEPTUAL GROUNDWATER FLOW UPPER WATER TABLE – APRIL 27, 2000	MALCOLM PIRNIE, INC. APRIL 2003 FIGURE 3-4



MALCOLM PIRNIE

WHITE CHEMICAL SUPERFUND SITE
NEWARK, NEW JERSEY

CONCEPTUAL GROUNDWATER FLOW
UPPER WATER TABLE – OCTOBER 17, 2000

MALCOLM PIRNIE, INC.
APRIL 2003
FIGURE 3–5

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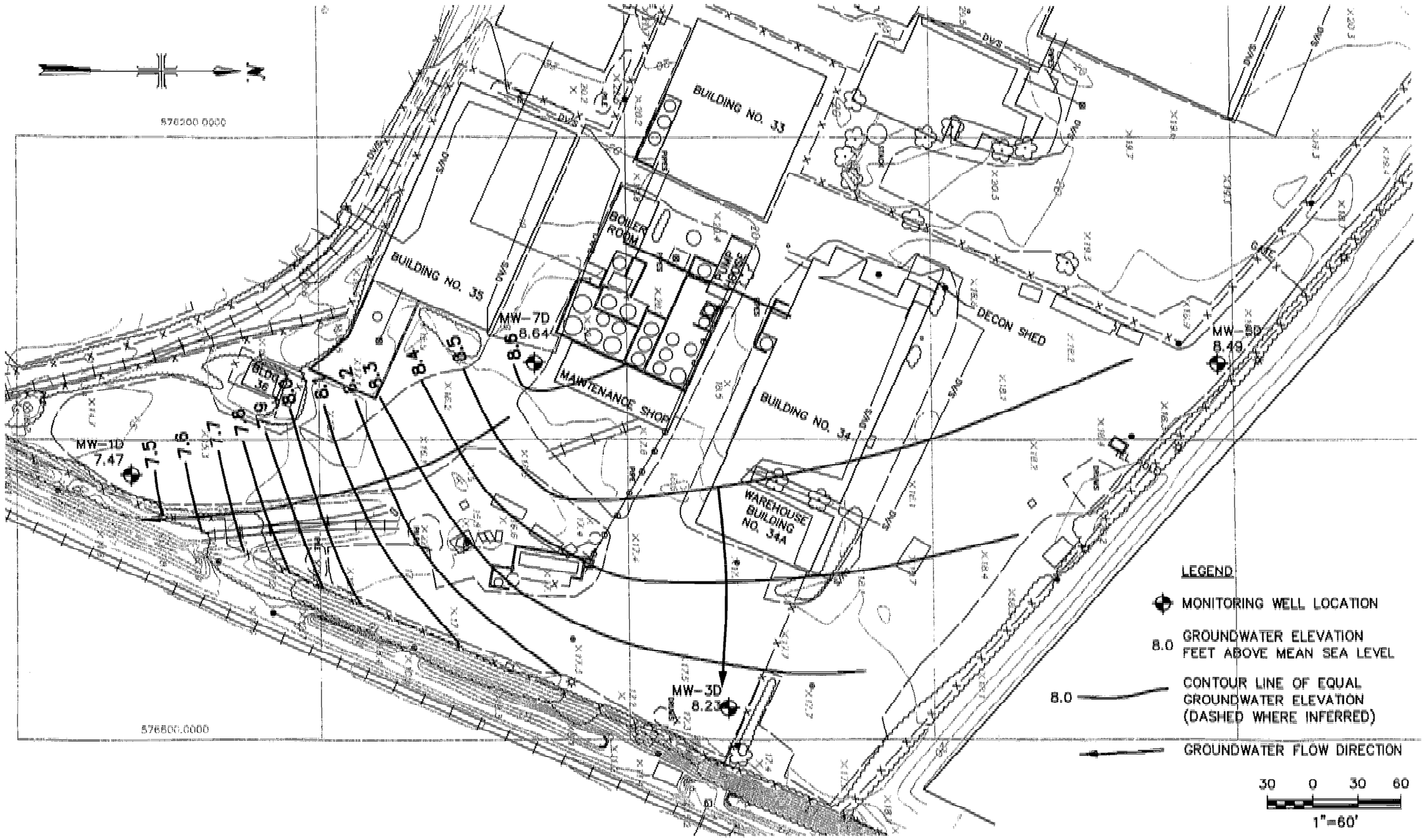

MALCOLM PIRNIE

WHITE CHEMICAL SUPERFUND SITE
NEWARK, NEW JERSEY

CONCEPTUAL GROUNDWATER FLOW
LOWER WATER TABLE – FEBRUARY 22, 1999

MALCOLM PIRNIE, INC.
APRIL 2003
FIGURE 3-6

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User: zunn, Spec: PIRNIE STANDARD File: I:\ACAD\PROJ\30200040\Groundwater\dw... \FIGURES\GWCONT-FIG 3-7.DWG Scale: 1:1 Date: 04/10/2003 Time: 12:37 ...yout: Layout2

576200.0000

576600.0000

BUILDING NO. 33

BUILDING NO. 35

BOILER ROOM

MAINTENANCE SHOP

BUILDING NO. 34

DECON SHED

WAREHOUSE BUILDING NO. 34A

MW-1D
6.83

MW-7D
7.58

MW-5D
8.12

MW-3D
7.6

7.0

7.1

7.4

7.5

7.6

7.8

8.0

LEGEND

- MONITORING WELL LOCATION
- 8.0 GROUNDWATER ELEVATION FEET ABOVE MEAN SEA LEVEL
- 8.0 CONTOUR LINE OF EQUAL GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

30 0 30 60

1"=60'

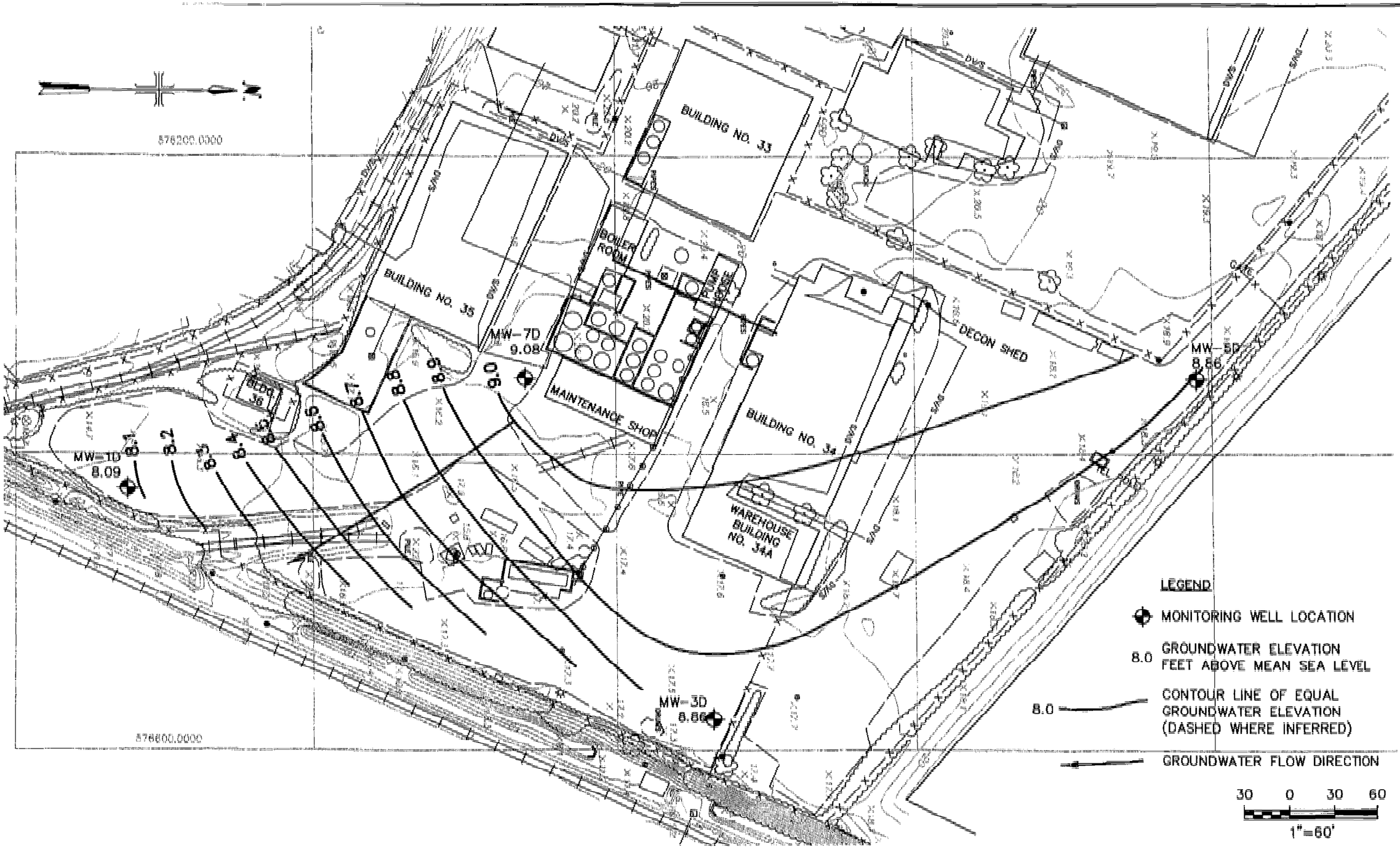
MALCOLM PIRNIE

WHITE CHEMICAL SUPERFUND SITE
NEWARK, NEW JERSEY

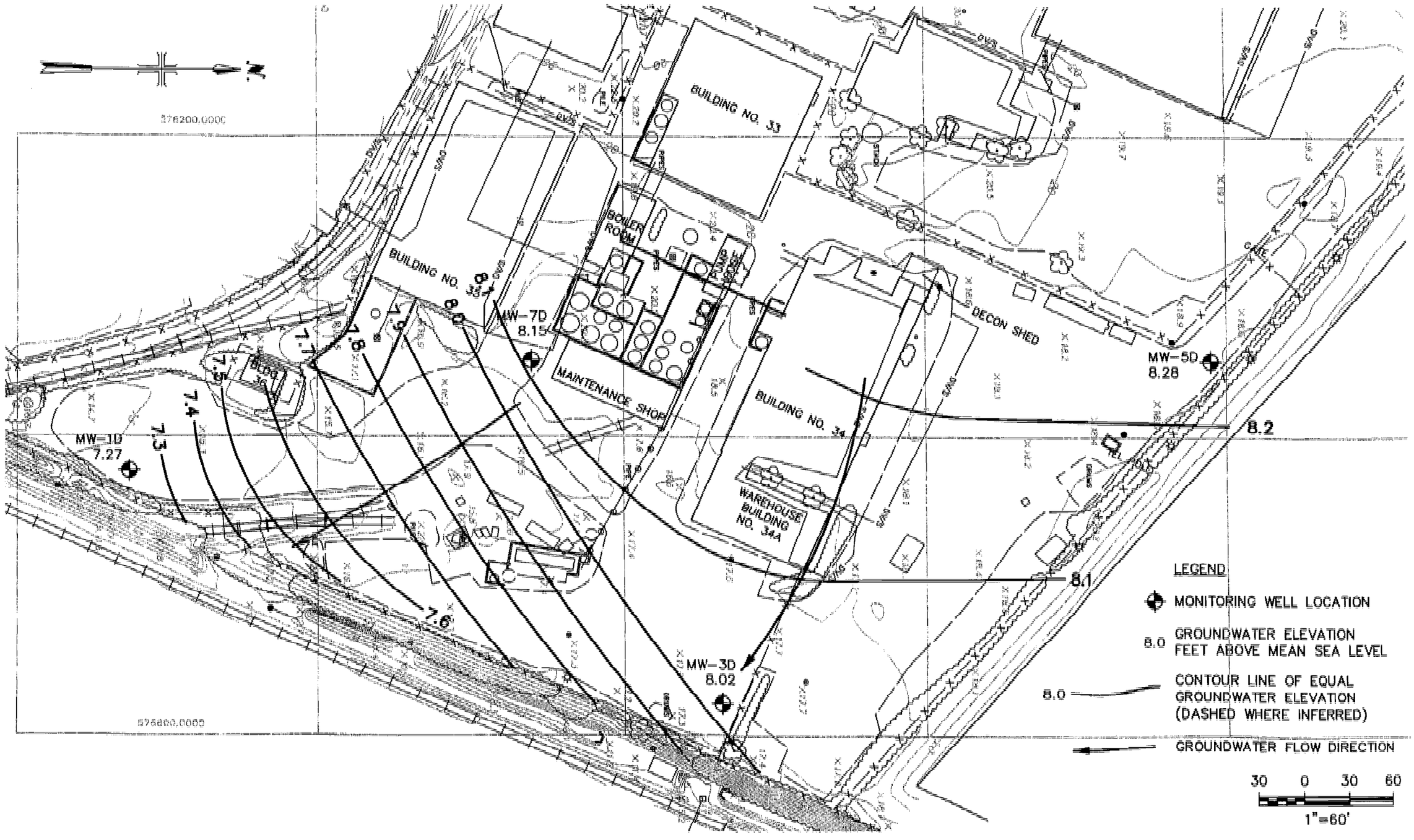
CONCEPTUAL GROUNDWATER FLOW
LOWER WATER TABLE – JULY 13, 1999

MALCOLM PIRNIE, INC.
APRIL 2003
FIGURE 3-7

User: zum , Spec: PIRNIE_STANDARD File: I:\ACAD\PROJ\30200040\Groundwater\dwg_r\FIGURES\GWCONT-FIG 3-8.DWG Scale: 1:1 Date: 04/10/2003 Time: 12:36 Layout: Layout2



MALCOLM PIRNIE	WHITE CHEMICAL SUPERFUND SITE NEWARK, NEW JERSEY	CONCEPTUAL GROUNDWATER FLOW LOWER WATER TABLE – APRIL 27, 2000	MALCOLM PIRNIE, INC. APRIL 2003 FIGURE 3–8



MALCOLM PIRNIE

WHITE CHEMICAL SUPERFUND SITE
NEWARK, NEW JERSEY

CONCEPTUAL GROUNDWATER FLOW
LOWER WATER TABLE – OCTOBER 17, 2000

MALCOLM PIRNIE, INC.
APRIL 2003
FIGURE 3-9

4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 INTRODUCTION

The following discussion on the nature and extent of contamination at the Site is based on validated data obtained from the sampling events described in Section 2.0. These samples include surface and subsurface soil, sump sediment, groundwater, and building materials. All soil samples were analyzed for full TCL/TAL, including cyanide. In addition, selected soil samples were analyzed for one or more of the following parameters: total phenols, pH, TOC, CEC, TCLP parameters, PBBs, dioxin, moisture content, grain size, bulk density, and atterberg limits. A summary of the soil sample analyses is presented in Table 4-1. All sump sediment samples were analyzed for full TCL/TAL, including cyanide, total phenols, pH, TOC, TCLP parameters, PBBs, moisture content, and grain size. All groundwater samples were analyzed for full TCL, full TAL (total and dissolved), cyanide, total phenols, TOC, nitrate, alkalinity, sulfate, TDS, chloride, and PBBs. Based on the type of sample, the building materials were analyzed for various parameters including asbestos, lead, full TCL/TAL, including cyanide, total phenols, PBBs, and TCLP parameters. The data summary tables in Appendix S present all sample results (e.g., surface soil, subsurface soil, sump sediment, groundwater, building material) for each major analytical group (e.g., VOCs, SVOCs).

Laboratory analyses were performed by both USEPA Contract Laboratory Program (CLP) laboratories and non-Routine Analytical Services (non-RAS) laboratories procured under subcontract. Laboratory analytical methodologies and data validation procedures were selected to meet the data quality objectives (DQOs) identified in the Work Plan (Malcolm Pirnie, 1998a). The laboratories' Statements of Work (SOW) and analytical methodologies were developed to be consistent with the CLP methodologies that were current at the time (OLM03.2 for TCL and ILM04.0 for TAL, including cyanide) or USEPA-approved analytical methods for non-RAS parameters. All data were validated by USEPA Region II certified data validators in accordance with USEPA guidelines. A summary of the analytical methods is presented in Table 4-2.

Tentatively identified compounds (TICs) were found most commonly in the SVOC fraction for soils; a few occurred in the VOC fraction. Those compounds that could be presumptively identified were flagged with both an "N" (presumptive evidence) and an "E" (estimated) qualifier. A portion of the TICs were ultimately rejected ("R") due to blank contamination. All other TICs were identified as unknown. For these reasons, the specific TICs that were detected have been omitted in the discussion of the nature and extent of contamination. Instead, the total concentration of TICs in each sample have been calculated by fraction (i.e., VOC and SVOC), and this information has been included on the data tables (contained in Appendix S) and in the appropriate sections below.

TABLE 4-1
SUMMARY OF SOIL SAMPLE ANALYSES
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Analyses	Samples
Full TCL	All soil samples except SB-31-01, SB-33-01, and SB-34-01
Full TAL, including CN	All soil samples
Total phenols	All soil samples except SB-12-03, SB-22-01, SB-22-02, SB-28-01, SB-32-01, SB-33-01, and SB-34-01
pH	All soil samples except SB-12-03, SB-22-01, SB-22-02, SB-28-01, SB-31-01, SB-31-02, SB-32-01, SB-33-01, and SB-34-01
TOC	All soil samples except SB-12-03, SB-22-01, SB-22-02, SB-28-01, SB-31-01, SB-31-02, SB-32-01, SB-33-01, and SB-34-01
CEC	All soil boring samples except SB-12-03, SB-22-01, SB-22-02, SB-28-01, SB-31-01, SB-31-02, SB-32-01, SB-33-01, and SB-34-01
TCLP parameters	All test pit samples as well as SS-3, SS-6, SS-12, SS-24, SS-37, SS-40, SS-44, SS-54, SS-71, SS-85, SS-87, SB-08-01, SB-11-01, SB-13-01, SB-15-01, and SB-24-01
PBBs	All test pit samples as well as SS-3, SS-6, SS-12, SS-24, SS-37, SS-40, SS-44, SS-54, SS-71, SS-85, SS-87, SB-07-03, SB-08-02, SB-11-01, SB-13-01, SB-15-01, SB-16-01, SB-24-01, SB-24-03, SB-28-02, SB-29-01, SB-30-01, SB-31-01, and SB-31-02
Dioxin	SS-3, SS-6, SS-12, SS-24, SS-37, SS-40, SS-44, SS-54, SS-71, SS-85, SS-87, SB-31-01, and SB-31-02
Physical Properties	SB-04-04, SB-05-04, SB-07-04, SB-10-04, SB-18-04, SB-26-04, SB-27-04, TP-01, TP-02, TP-03, TP-03A, TP-04A, TP-05, TP-06, and TP-06A

Note:

Physical properties include atterberg limits, moisture content, grain size distribution and bulk density. Not all samples were analyzed for each physical property parameter. The type of soil determined which tests were conducted.

TABLE 4-2
SUMMARY OF ANALYTICAL METHODS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Analyses	Analytical Method
Soil Samples	
VOCs	SW-846 Method 8260B[1]
TCL SVOCs, Pesticides/PCBs	CLP SOW OLM03.2[2]
Full TAL, including cyanide	CLP SOW ILM04.0[2]
Total phenols	SW-846 Method 9066[1]
pH	SW-846 Method 9045C[1]
TOC	USEPA, Lloyd Kahn Method[3]
CEC	SW-846 Method 9081[1]
TCLP parameters	Extraction - SW-846 Method 1311[1] VOCs - SW-846 Method 8260B[1] SVOCs - SW-846 Method 8270C[1] Pesticides - SW-846 Method 8081A[1] Herbicides - SW-846 Method 8151A[1] Metals, except Mercury - SW-846 Method 6010B[1] Mercury - SW-846 Method 7470A[1]
PBBs	High Resolution Gas Chromatography (HRGC)/Low Resolution Mass Spectrometry (LRMS)[4]
Dioxins	SW-846 Method 8290[1]
Moisture content	ASTM D2216-92[5]
Grain size	ASTM D422-63[5]
Bulk density - minimum and maximum	ASTM D4254-91[5] and ASTM D4253-94[5]
Atterberg limits	ASTM D4318-96[5]

Notes:

(1) SW-846 - USEPA, Test Methods for Evaluating Solid Waste, Laboratory Manual Physical/Chemical Methods
(2) USEPA Contract Laboratory Program Statement of Work
(3) Lloyd Kahn Method, Determination of Total Organic Carbon in Sediment, USEPA Region II, July 27, 1988
(4) There are no approved USEPA analytical methods for PBB analysis
(5) American Society for Testing and Materials (ASTM) Standards for Construction
(6) Interim Method for the Determination of Asbestos in Bulk Insulation Samples, EPA 600/MA-82-020
(7) Methods for Chemical Analysis of Water and Wastes, EPA 600/4/79-020

TABLE 4-2
SUMMARY OF ANALYTICAL METHODS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Analyses	Analytical Method
Building Material Samples	
Asbestos	Transmission Electron Microscopy (TEM) and Polarized Light Microscopy (PLM)[6]
Lead	SW-846 Method 6010B[1]
TCL SVOCs, Pesticides/PCBs	CLP SOW OLM03.2[2]
Full TAL, including cyanide	CLP SOW ILM04.0[2]
Total phenols	SW-846 Method 9066[1]
PBBs	HRGC/LRMS[4]
TCLP parameters	Extraction - SW-846 Method 1311[1] VOCs - SW-846 Method 8260B[1] SVOCs - SW-846 Method 8270C[1] Pesticides - SW-846 Method 8081A[1] Herbicides - SW-846 Method 8151A[1] Metals, except Mercury - SW-846 Method 6010B[1] Mercury - SW-846 Method 7470A[1]
Groundwater Samples	
Full TCL	CLP SOW OLM03.2[2]
Full TAL, including cyanide	CLP SOW ILM04.0[2]
Total phenols	SW-846 Method 9066[1]
TOC	MCAWW Method 415.1[7]
Nitrate	MCAWW Method 353.2[7]
Alkalinity	MCAWW Method 310.2[7]
Sulfate	SW-846 Method 9038[1]
TDS	MCAWW Method 160.1[7]
Chloride	SW-846 Method 9251[1]
PBBs	HRGC/LRMS[4]

Notes:

(1) SW-846 - USEPA, Test Methods for Evaluating Solid Waste, Laboratory Manual Physical/Chemical Methods
(2) USEPA Contract Laboratory Program Statement of Work
(3) Lloyd Kahn Method, Determination of Total Organic Carbon in Sediment, USEPA Region II, July 27, 1988
(4) There are no approved USEPA analytical methods for PBB analysis
(5) American Society for Testing and Materials (ASTM) Standards for Construction
(6) Interim Method for the Determination of Asbestos in Bulk Insulation Samples, EPA 600/MA-82-020
(7) Methods for Chemical Analysis of Water and Wastes, EPA 600/4/79-020

4.2 CONTAMINANT AND LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND TO BE CONSIDERED MATERIALS

4.2.1 Introduction

Section 121(d)(2)(A) of CERCLA incorporates into law the CERCLA Compliance Policy, which specifies that Superfund remedial actions meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). State ARARs must be met if they are more stringent than federal requirements. Furthermore, Section 121 requires the selection of a remedial action that is protective of human health and the environment. Determining protectiveness involves a risk assessment in accordance with CERCLA guidance.

A requirement under other environmental laws may be either "applicable" or "relevant and appropriate," but not both. Identification of ARARs must be done on a site-specific basis and involves a two-part analysis: first, a determination on whether a given requirement is applicable; then if it is not applicable, a determination whether it is nevertheless both relevant and appropriate. According to 40 CFR 300.400(g), ARARs are defined as follows:

Applicable Requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a release of hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and Appropriate Requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Three classifications of ARARs have been established and include:

- Chemical-Specific - Usually health or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment;

- Location-Specific - Restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations; and

- Action-Specific - Usually technology or activity-based requirements or limitations on actions taken with respect to hazardous wastes.

To Be Considered materials (TBCs) are other federal and state advisories, criteria, and guidance issued by the federal or state government which may be considered for a particular

release if useful in developing CERCLA remedies (40 CFR 300.400(g)(3)). As described below, TBCs will be considered along with ARARs as part of the Site risk assessment and may be used in determining the necessary level of cleanup for protection of health and the environment.

ARARs and TBCs (as appropriate) must be attained for hazardous substances, pollutants, or contaminants remaining on-site at the completion of the remedial action, unless waiver of an ARAR is justified. In addition, the USEPA intends that the implementation of remedial actions should also comply with ARARs and TBCs (as appropriate) to protect public health and the environment. ARARs and TBCs (as appropriate), pertaining both to contaminant levels and performance or design standards, should generally be attained at all points of potential exposure, or at the point specified by the ARAR itself.

4.2.2 Comparison to ARARs and TBCs

The various media (soil, sump sediment, and groundwater) analytical results were compared to ARARs and TBCs for VOCs, SVOCs, pesticide/PCBs, and inorganics. The soil/sediment TBCs were obtained from both the USEPA and NJDEP. The USEPA has Soil Screening Levels (SSLs) for three pathways; ingestion, inhalation, and migration to groundwater. In addition, there are two SSLs for the migration to groundwater pathway; a 20 dilution-attenuation factor (DAF) and a 1 DAF. The 20 DAF accounts for natural processes that reduce contaminant concentrations in the subsurface while the 1 DAF does not account for either dilution or attenuation. Due to the presence of degradation products in the subsurface as well as the length of time the Site has been inactive, the 20 DAF values were used. The NJDEP has Soil Cleanup Criteria (SCC) for residential direct contact, non-residential direct contact, and impact to groundwater. Due to the industrial nature of the Site and surrounding area and since there is no indication that the Site will be re-zoned for non-commercial use, NJDEP residential criteria were not considered TBCs in this report. In all cases, the lowest value from any of the pathways were used as the TBCs.

The groundwater ARARs were also obtained from both the USEPA and the NJDEP. The USEPA has Maximum Contaminant Levels (MCL) while the NJDEP has Groundwater Quality Criteria (GQC). The ARARs and TBCs for the Site are summarized in Table 4-3. The ARAR and TBC values are contained on the data summary tables in Appendix S.

A comparison of the sample results to the ARARs/TBCs indicated that the detection limits for a portion of the contaminants in certain samples were greater than the ARARs/TBCs. The reasons for the elevated detection limits are detailed below.

4.2.2.1 VOC Detection Limits

In accordance with NJDEP requirements, all VOC soil and sediment samples collected during the RI were collected using the methanol preservation methodology. The objective of the methanol preservation methodology is to minimize the loss of VOCs through volatilization and biodegradation. Methanol preserved samples are analyzed using a medium level analytical procedure, which results in elevated detection limits. In addition, the sump sediment samples had a high moisture content, which also raised the detection limits.

High levels of halogenated VOCs were detected in many of the groundwater samples. These samples were diluted during analysis, which resulted in elevated detection limits (i.e., contract required quantitation limits (CRQL)).

TABLE 4-3
SUMMARY OF ARARs and TBCs
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Media	Parameter	ARARs/TBCs
Soil/Sump Sediment	Full TCL/TAL, including cyanide	USEPA Soil Screening Levels, 1996 NJDEP Soil Cleanup Criteria, proposed rule *Cleanup Standards for Contaminated Sites*, N.J. Administrative Code (N.J.A.C.) 7:26D, 1999
Soil/Sump Sediment	TCLP parameters	RCRA Regulatory Limits, 40 CFR §261.24
Soil/Sump Sediment	Dioxins	ATSDR Interim Policy Guideline, Dioxin and Dioxin-Like Compounds in Soil, 1997
Groundwater	Full TCL/TAL, including cyanide, TDS, sulfate, chloride, and nitrate	USEPA MCLs, Drinking Water Standards and Health Advisories, 1996 NJDEP GQC, N.J.A.C. 7:9-6

4.2.2.2 SVOC Detection Limits

All soil and sediment SVOC samples collected for the RI were analyzed using CLP methods. According to the CLP SOW, the laboratory is required to screen all samples to determine whether the sample should be analyzed using low or medium level methods. A portion of the samples were analyzed using a medium level method due to the high concentrations of TICs present in the sample. Another portion of the samples were analyzed via the low level method; however, dilutions were subsequently required due to the high TIC concentrations. Using a medium level method as well as diluting a sample will both result in elevated CRQLs. In addition, the high moisture content in the sump sediment samples also raised the detection limits.

4.2.2.3 Pesticide Detection Limits

Elevated levels of pesticides were detected in a small portion of the soil and sediment samples. The samples, therefore, were diluted which resulted in elevated CRQLs. In addition, the high moisture content in the sump sediment samples also raised the detection limits.

4.2.2.4 Inorganic Detection Limits

The detection limit (i.e., Contract Required Detection Limit (CRDL)) for arsenic in soil is greater than the TBC; however, this contaminant was detected at a concentration above the TBC in the majority of the samples. The CRDL for beryllium in the sump sediment samples is greater than the TBC since these samples had a high moisture content.

4.2.3 Determination of Site-Specific Background

Two off-site soil samples (SB-31-01 and SB-31-02) were collected from Weequahic Park to represent background conditions for VOCs, SVOCs, pesticides/PCBs, total phenols, PBBs, and dioxin. SB-31-01 was collected from 2 to 4 feet bgs and SB-31-02 was collected from 8 to 10 feet bgs. Analysis of SB-31-01 indicated the presence of trace levels of pesticides (4,4'-DDE (1.2 J[1] µg/kg) and 4,4'-DDT (0.8 J µg/kg)) and dioxins. For this report, the dioxin values were normalized to 2,3,7,8-TCDD using toxicity equivalency factors (TEFs) specified by the World Health Organization (WHO) and van den Berg et al. (1998) and recommended by the USEPA[2]. The normalized dioxin value detected in SB-31-01 is 1.34 nanograms per kilogram (ng/kg). No detectable levels of VOCs, SVOCs, or PBBs were found in SB-31-01. Analysis of SB-31-02 indicated the presence of trace levels of VOCs (toluene (450 J µg/kg) and acetone (310 J µg/kg)), a pesticide (methoxychlor (68 E[3] µg/kg)), and dioxins (normalized value 0.00 ng/kg). No detectable levels of SVOCs or PBBs were found in SB-31-02.

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[1]J - estimated value, compound detected at a concentration above the instrument detection limit (IDL), but below the CRQL or CRDL, as applicable.

[2]According to the WHO and van den Berg et al (1998) the following TEF values were used: 2,3,7,8-TCDD - 1; 1,2,3,7,8-pentachlorodibenzo-p-dioxin (PeCDD) - 1; 1,2,3,4,7,8-hexachlorodibenzo-p-dioxin (HxCDD) - 0.1; 1,2,3,6,7,8-HxCDD-0.1; 1,2,3,7,8,9-HxCDD - 0.1; 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin (HpCDD) - 0.01; and octachlorodibenzo-p-dioxin (OCDD) - 0.0001. To obtain the normalized dioxin value, all dioxin congeners are multiplied by the applicable TEF and the resulting values are summed.

[3]E - estimated value, compound qualified as estimated as a result of the data validation process.

Five off-site soil samples (SB-31-01, SB-31-02, SB-32-01, SB-33-01, and SB-34-01) were collected from Weequahic Park to represent background conditions for inorganics, including cyanide. SB-31-01 was collected from 2 to 4 feet bgs, SB-31-02 was collected from 8 to 10 feet bgs, and SB-32-01, SB-33-01, and SB-34-01 were collected from 3 to 5 feet bgs. The Site-specific background concentrations for inorganics were obtained by averaging the concentrations detected in all five samples. The results of the background calculations are presented in Table 4-4. Weequahic Park was chosen as representative of background since this area is not known to have been affected by Site activities.

During installation of the 11 monitoring wells, two wells (one shallow and one deep) were installed on the northwestern portion of the Site. At the time, groundwater flow was assumed to be eastward toward Newark Bay; however, no Site-specific hydrogeologic information was available to confirm this assumption. The water level data collected during the RI indicate that shallow groundwater flow is radial away from a hydraulic mound that exists in the vicinity of Building No. 34, thereby, creating a groundwater divide. Mounding of groundwater in the vicinity of Building No. 34 may be caused by the flooded tunnel that exists under this building. North of the divide, groundwater flows in an easterly direction; south of the divide groundwater flows more uniformly to the south. The groundwater divide is less evident at depth. The direction of deeper groundwater flow is fairly consistent with the shallow groundwater flow and follows the surface of the underlying bedrock. In the southern portions of the Site, the main component of groundwater flow at depth is to the south, with groundwater flow in the northern portion of the Site varying from northeasterly to southeasterly. The existence of the groundwater divide and variable flow directions, therefore, resulted in no appropriate upgradient background wells.

A search of the NJDEP Environmental Cleanup Responsibility Act (ECRA) files was conducted to find potentially suitable background wells in the Site vicinity. Numerous facilities which had undergone ECRA investigations were identified near the Site; however, after reviewing the ECRA files for each, only three sites had monitoring wells that were constructed to comparable depths as the wells on the WCC Site. Construction details and sampling information for the three ECRA monitoring wells are presented in Table 4-5. The location of the three ECRA sites are shown on Figure 4-1. The analytical results from the ECRA wells, however, only contained VOC data. The analytical results indicated the presence of trace levels of VOCs (methylene chloride (maximum of 6.1 µg/L), acetone (maximum of 130 µg/L), 4-methyl-2-pentanone (MIBK) (1.7 J µg/L), and 2-hexanone (MEK) (2.3 J µg/L)). Copies of the ECRA files for these three sites are contained in Appendix T. Recent information obtained from the NJDEP confirms that the Penick Corporation site may also have potentially suitable background wells. The primary groundwater contaminant at the Penick Corporation site is TCE and its degradation products; groundwater flow is easterly. In addition, DNAPL exists above the bedrock.

Site-specific background for soils and groundwater are also discussed in the respective sections below for each analytical group (e.g., VOCs, SVOCs).

TABLE 4-4
SITE-SPECIFIC BACKGROUND CONCENTRATIONS FOR INORGANICS IN SOIL
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Analyte	Site-Specific Background Concentration (in mg/kg)	Analyte	Site-Specific Background Concentration (in mg/kg)
Aluminum	10,480	Magnesium	4,170
Antimony	non-detect	Manganese	374
Arsenic	2.1	Mercury	non-detect
Barium	52.1	Nickel	16.2
Beryllium	0.44	Potassium	1,370
Cadmium	non-detect	Selenium	non-detect
Calcium	931	Silver	0.4
Chromium	13.8	Sodium	174
Cobalt	7.1	Thallium	0.94
Copper	17.3	Vanadium	19.2
Iron	17,020	Zinc	43.1
Lead	7.2	Cyanide	non-detect

TABLE 4-5
ECRA MONITORING WELL DETAILS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Location	MW No.	Well Depth (bgs) (in feet)	Screen Interval (bgs) (in feet)		Material Screened	Construction details	Sampling Method	Analytical Method	Date of Analysis	Analytical Results
			TOP	BOT						
Patent Scaffolding Company, 429 Frelinghuysen Avenue, Newark, NJ										
~ 2,000 feet north of WCC	MW-2	16	3	16	2 feet of ash fill, reddish/grayish brown silt, sand, and gravel	4-inch PVC with 0.020-slot screen	Teflon bailers	USEPA 624	June 1994	Methylene Chloride - 1 µg/L
Rhone-Poulenc/Colloids, Inc., 394-400 Frelinghuysen Avenue, Newark NJ										
~ 2,500 feet north of WCC	MW-10	15	5	15	Dark reddish brown medium to coarse sand with some gravel	4-inch PVC with 0.010-slot screen	Teflon bailers	Unknown	1997	Methylene Chloride - 6.1 µg/L Acetone - 25 µg/L MIBK - 1.7 J µg/L MEK - 2.3 J µg/L
Former Dollar Rent A Car Facility, 162 Rt. 1, Newark, NJ										
~ 2,000 feet southeast of WCC	MW-4	10	5	10	Fill material with reddish brown to dark brown silty sand	4-inch PVC with 0.020-slot screen	Low Flow Purging and Sampling	USEPA 624	July 1996	Methylene Chloride - 1.4 J µg/L Acetone - 130 µg/L
								USEPA SW-846 8240	December 1996	All VOCs - non-detect

Notes:

(1) MIBK - 4-Methyl-2-Pentanone
(2) MEK - 2-Hexanone

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4.3 SAMPLED MEDIA

The following section summarizes the nature and extent of contamination in each medium sampled. In the surface and subsurface soil subsections, laboratory analytical data from all applicable sampling locations (i.e., test pits, surface soils, and soil borings) are presented together. The vertical extent of the selected contaminants in soils have been grouped into surface (0 to 2 feet) and subsurface (greater than 2 feet)[4] soils.

As is detailed below, soil contamination is present throughout the Site; however, the majority of the contamination is present in the upper two feet of soil. A review of the contaminant concentrations detected near the Site boundaries was conducted to determine if contamination appeared to be migrating off-Site. Elevated levels of contamination were found in the surface soil near the southwestern Site boundary. However, this area represents a topographic low and it is likely that contaminants would migrate vertically not horizontally. Therefore, it is unlikely that any off-Site migration of contamination through the unsaturated soil is occurring.

The majority of the contamination at the Site is the result of the improper staging, control and maintenance of process chemicals contained in drums, laboratory chemical containers, storage tanks and process tanks. Chemicals found at the property include flammable liquids, corrosives, acids, oxidizers, shock-sensitive material, and air/water-reactive substances. A partial summary of the drummed chemicals and wastes that were removed from the WCC Site during the USEPA removal action in 1990-1991 is presented in Table 4-6.

4.3.1 Surface Soil

4.3.1.1 Volatile Organic Compounds

Analysis of 109 surface soil samples indicated the presence of 23 VOCs; however, only 13 were detected at concentrations that exceeded the TBCs. These include chlorinated compounds (1,1,2,2,-tetrachloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane, carbon tetrachloride, methylene chloride, tetrachloroethene, cis-1,2-dichloroethene, trichloroethene, and vinyl chloride) and hydrocarbons (benzene, ethylbenzene, m,p-xylene, and o-xylene). Three primary areas at the Site contain surface soil VOC contamination above the TBCs: the northeast corner (between the warehouse and the eastern and northern Site boundaries); the southeast corner (near the southeastern Site boundary); and the center of the Site (between the former AST farm and Building No. 34). No trend regarding locations of specific classes of compounds was found. A map showing the locations of VOCs in surface soil above the TBCs is presented in Plate 3. A tabular summary of VOCs detected in surface soil is presented in Table 4-7.

1,1,2,2-Tetrachloroethane was detected in 24 samples at concentrations ranging from 93 J µg/kg to 28,000 µg/kg, all of which exceeded the USEPA SSL guidance value of 3 µg/kg. Nine of these samples also exceeded the NJDEP SCC (1,000 µg/kg). 1,1,2-trichloroethane was

[4] Approximately 80 percent (87 of 109 locations) of all surface soil or soil boring locations at the Site were covered with at least one foot of impermeable material, usually asphalt or concrete. The depth of the sample below this impermeable material was used to classify that sample as a surface soil or a subsurface soil. For example, a soil boring sample collected immediately below a one-foot thick asphalt layer was labeled 0-2 feet and classified as a surface soil sample. The first sample from another soil boring location that was not covered with asphalt was collected from 0-2 feet and was also classified as *a* surface soil sample.

to a depth of 21 feet bgs. Monitoring well details are presented in Table 2-1 and well construction diagrams are contained in Appendix H.

The shallow monitoring wells were constructed using 4 1/4-inch internal diameter hollow stem augers and installing the screen and riser through the augers. The wells were installed so that the screens intersected the water table, with approximately three feet of screen above the water table and seven feet of screen below the water table. A sand pack consisting of clean Morie No. 0 sand was placed from approximately three feet below the screen to approximately two feet above the screen. Following this, a cement grout was placed from the top of the sand pack to ground surface.

An 8-inch diameter, stainless steel protective casing with locking cap was installed on those wells completed as stick-ups. The flush-mounted well was finished using a manhole cover and concrete pad.

2.3.1.2 Deep Monitoring Wells

Prior to installing the deep monitoring wells, four pilot borings (PB-1 through PB-4) were drilled to determine the design and completion depths for the wells, since both of these were dependent upon the presence or absence of the marshland deposits. Since no marshland deposits were encountered in the pilot borings, each of the four deep monitoring wells, MW-1D, MW-3D, MW-5D, and MW-7D, were installed at the base of the overburden deposits. Due to the shallow depth to bedrock (37 to 55 feet bgs) at the Site, a decision was made, with the concurrence of both the USEPA and NJDEP, to use five-foot screens instead of the ten-foot screens proposed in the FSP. The deep wells were constructed with a five-foot length of two-inch diameter, 10 slot, stainless steel screen with two-inch diameter stainless steel riser pipe. A two-foot length, two-inch diameter stainless steel sump was placed at the bottom of the screen. The riser pipe in each well extended approximately 1.5 to 2 feet above ground surface, except for MW-5D, which was flush-mounted. Total depths ranged from 32 feet bgs in MW-5D and MW-7D to 48 feet bgs in MW-1D. Monitoring well details are presented in Table 2-1 and well construction diagrams are contained in Appendix H.

The deep monitoring wells were installed using the same drilling methods as the shallow monitoring wells. A sand pack consisting of clean Morie No. 0 sand was placed from approximately three feet below the screen to approximately two feet above the screen. Following this, a cement grout was tremied from the top of the sand pack to the ground surface.

An 8-inch diameter, stainless steel protective casing with locking cap was installed on those wells completed as stick-ups. The flush-mounted well was finished using a manhole cover and concrete pad.

2.3.2 Well Development

From January 12, 1999 to January 28, 1999, all of the newly installed monitoring wells were developed using a decontaminated, two-inch diameter, stainless steel submersible pump with dedicated polyvinyl chloride (PVC) tubing. The monitoring wells were developed in an effort to remove fine-grained material from the formation and the filter pack and to increase the hydraulic connection between the well and the aquifer. The wells were developed until the turbidity measurements dropped below 50 nephelometric turbidity units (NTUs) and specific conductivity and pH had stabilized. In general, the wells stabilized within 1½ to four hours. During development, the discharge water was tested every half hour for field parameters

TABLE 2- 1
MONITORING WELL DETAILS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Monitoring Well No.	Well Depth (bgs) (in feet)	Screen Interval (bgs) (in feet)		Screen Length	Casing Elevation (in feet)	Ground Elevation (in feet)	DTW (in feet) February 22, 1999	GW Surface Elevation (in feet)	DTW (in feet) July 13, 1999	GW Surface Elevation (in feet)	DTW (in feet) April 27, 2000	GW Surface Elevation (in feet)	DTW (in feet) October 17, 2000	GW Surface Elevation (in feet)
		TOP	BOT											
Shallow Wells														
MW-1S	19	7	17	10	17.79	14.927	9.98	7.81	10.87	6.92	9.40	8.39	10.42	7.37
MW-2	19	7	17	10	19.37	17.247	10.77	8.60	11.67	7.70	10.26	9.11	11.30	8.07
MW-3S	19	7	17	10	19.29	17.467	10.62	8.67	11.30	7.99	10.04	9.25	10.91	8.38
MW-4	20	8	18	10	20.05	18.167	11.61	8.44	12.22	7.83	Not measured	Not measured	11.88	8.17
MW-5S	19	7	17	10	18.40	18.067	9.80	8.60	10.37	8.03	9.37	9.03	10.02	8.38
MW-6	19	7	17	10	20.77	18.917	11.85	8.92	12.64	8.13	11.72	9.05	12.31	8.46
MW-7S	19	7	17	10	19.86	17.807	11.20	8.66	12.05	7.81	10.80	9.06	11.70	8.16
Deep Wells														
MW-1D	47	40	45	5	16.52	14.967	9.05	7.47	9.69	6.83	8.43	8.09	9.25	7.27
MW-3D	43	36	41	5	19.33	17.517	11.10	8.23	11.72	7.61	10.47	8.86	11.31	8.02
MW-5D	31	24	29	5	18.30	17.967	9.81	8.49	10.18	8.12	9.44	8.86	10.02	8.28
MW-7D	31	24	29	5	19.46	17.577	10.82	8.64	11.88	7.58	10.38	9.08	11.31	8.15

DTW - Depth to Water
Measurements could not be collected from MW-4 during the 3rd round since the padlock was rusted shut.

(temperature, specific conductivity, pH, and turbidity). Monitoring well development logs, summarizing the volume removed, elapsed time, and field parameter measurements are presented in Appendix I.

2.3.3 Collection of Groundwater Samples

Two rounds of groundwater samples were collected from the eleven monitoring wells. The first round of sampling was conducted from February 23, 1999 to March 3, 1999 and the second round of sampling was conducted from July 13, 1999 to July 21, 1999.

2.3.3.1 Field Measurements

A headspace reading was taken from each monitoring well during both rounds of sampling with a PID after removal of the well cap and before purging. The headspace readings were zero for all monitoring wells. During purging of the monitoring wells, the purge water was continuously monitored for temperature, specific conductance, redox potential (Eh), pH, dissolved oxygen (DO), and turbidity using a flow-through cell. Written measurements were collected approximately every five minutes. During both the first and second rounds of groundwater sampling, Eh measurements were not collected from all of the monitoring wells due to a malfunction of the instrument. Groundwater sample collection logs, summarizing the purged volumes of well water, the elapsed time, and field parameter measurements are contained in Appendix J.

2.3.3.2 Sample Collection Method

All groundwater samples were collected using the low flow purging and sampling method. A decontaminated two-inch diameter stainless steel submersible pump with dedicated Teflon™ or Teflon™-lined polyethylene tubing was used to purge and sample the wells. During both sampling rounds purging was conducted at a rate less than 500 milliliters/minute (ml/min). During the first sampling round, purging at each well was conducted for a minimum of 35 minutes and a maximum of 5.7 hours. During the second sampling round, purging was conducted for a minimum of 60 minutes and a maximum of 5.4 hours. Purging was considered complete when the field parameters stabilized. If the field parameters did not stabilize (and did not show any indication of stabilizing), the well was sampled when at least five well volumes had been purged and purging had continued for at least four hours. Sampling was conducted at rates less than 100 ml/min and 250 ml/min for the volatile fraction and non-volatile fractions, respectively. Due to the presence of extremely fine silt in the wells, the pump clogged on numerous occasions, making both purging and sampling difficult.

All of the groundwater samples were analyzed for Full TCL, Full TAL (both total and dissolved), cyanide, total phenols, TOC, nitrate, alkalinity, sulfate, total dissolved solids (TDS), chloride, and PBBs. The dissolved TAL samples were passed through dedicated in-line 45-micron filters during sampling. All samples were collected in accordance with the sampling procedures described in the FSP. Groundwater data are discussed in Section 4.3.4.

2.3.3.3 Groundwater Elevation Measurements

Four synoptic rounds of groundwater elevations were collected on February 22, 1999, July 13, 1999, April 27, 2000 and October 17, 2000. Groundwater elevations were used to evaluate the direction of groundwater flow across the site.

Depth to groundwater measurements were made with an electronic water level indicator; all measurements were made relative to a permanent marking on the top of the stainless steel casing. The measuring points were surveyed with respect to NGVD of 1929 for vertical coordinates and the NAD of 1983 for horizontal coordinates. Refer to Section 2.1.2 for details regarding the survey. Measuring point elevations and groundwater elevation data are presented in Table 2-1. Groundwater elevation data are discussed in Section 3.5.2.

2.3.3.4 Aquifer Testing

Slug tests were performed on March 4 and 5, 1999 on each of the monitoring wells to estimate the hydraulic conductivity of the unconsolidated deposits in the vicinity of the wells. Both rising and falling head slug tests were conducted on the four deep wells. Only rising head slug tests were performed on the seven shallow wells since the well screens bridge the water table, allowing some of the screen to be exposed to the unsaturated zone.

During the slug tests, changes in water levels were recorded with an In-Situ, Inc. Hermit 1000C data logger and PXD-261 pressure transducer. The pressure rating of the transducer was 20 pounds per square inch (psi). Before setting up the equipment at the well and at the end of each test, the water level was measured with an electronic water-level indicator. A pressure transducer was then placed in each well, approximately one foot above the bottom of the well, and the water level was allowed to return to static conditions. During the falling head slug tests, a four-foot long, 0.14-foot diameter PVC slug was inserted into the well. The data logger test was started simultaneously with the slug insertion. Once the water level equilibrated, the data logger test was stopped. The slug was then removed from the well to conduct the rising head test. The data logger test was again started simultaneously with the slug removal. Once the water level returned to static conditions, the test was stopped. The transducers, cables, and slug were all decontaminated prior to use in another well. The recovery-time data were analyzed with Aqtesolv software using the Bouwer and Rice solution method. The slug test data and the plots generated using Aqtesolv are presented in Appendix K. Slug test data are discussed in Section 3.5.2.

2.4 BUILDING INVESTIGATION

2.4.1 Asbestos Sampling

On December 10, 23, and 29, 1998, a building material survey was conducted by a certified asbestos inspector to identify any suspect ACM present in the on-site buildings. During the survey, functional spaces (spatially distinct units within a building, e.g., an office) and homogenous sampling areas (areas containing ACM that were uniform in texture and color and appeared identical in every other respect) were identified. Inaccessible areas (e.g., enclosed cavities and pipe chases) were not included in the survey. The location and quantity of each suspect ACM was noted, along with a description of the type of material. A copy of the building material survey is contained in Appendix L. The purpose of the asbestos sampling was to locate and identify all accessible friable and non-friable ACM to support selection of a remedial alternative for the buildings.

Based on the results of the survey, 74 asbestos samples were collected from the Site buildings from January 5 - 7, 1999; 20 samples from Building No. 33, 16 samples from Building No. 34, 23 samples from Building No. 35, nine samples from the Boiler Room, two samples

from the Decon Shed, one sample from the Maintenance Shop, two samples from the Pump House, and one sample from the area south of Building No. 35. There was no material identified for collection from Building No. 36. Materials that were sampled included boiler breeching, pipe and pipe fitting insulation, block insulation, tank insulation, roof shingles and flashing, counter tops, floor tile and mastic, panels in fume hoods, ceiling tiles, wallboard, plaster lathe, transite panels, window caulking and putty, pipe insulation, and miscellaneous debris. The locations of the samples are listed in Table 2-2.

The majority of the asbestos samples were collected by wetting the material with an amended water solution until thoroughly saturated and pressing a coring device through all layers of the suspect material to the substrate. Floor tiles, mastic, and caulking were collected by prying up the material with a sharp knife. All samples were then placed into an air-tight bag. All samples were collected in accordance with the procedures described in USEPA's *Guidance for Controlling Asbestos-Containing Materials in Buildings*, the protocols described in the Asbestos Hazard Emergency Response Act (AHERA) 40 Code of Federal Regulations (CFR) 763.86, and the sampling procedures described in the FSP. Asbestos analytical data and sample location maps are presented in Section 4.3.5.

2.4.2 Lead Paint/Dust Sampling

2.4.2.1 X-Ray Fluorescence (XRF) Sampling

From January 4-6, 1999, a building material survey and investigation was conducted in the on-site buildings to identify the presence of any lead-based paint. During the survey, room equivalents (spatially distinct units within a building, e.g., an office) components (e.g., ceiling, floor, walls), substrate (material underneath the paint), and testing combinations (characterized by room equivalent, component, substrate, and visible color of the paint) were identified. Inaccessible areas (e.g., the ceiling and roof of Building No. 34) and areas that were not visible to the inspector were not included in the investigation. A copy of the building material survey is contained in Appendix L. Based on the results of the survey, XRF readings were collected from the Site buildings from representative painted surfaces. Readings were not collected in areas where the presence or absence of paint could not be definitively determined. The XRF testing was conducted by a New Jersey certified lead-based paint inspection subcontractor in accordance with U.S. Department of Housing and Urban Development (HUD) Guidelines (1997 Revisions) under the supervision of Malcolm Pirnie.

Altogether, 967 XRF readings were collected; 361 readings from Building No. 33, 138 readings from Building No. 34, 372 readings from Building No. 35, 33 readings from Building No. 36, 15 readings from the Maintenance Shop, 21 readings from the Boiler Room, and 27 readings from the Pump House. In addition, 33 calibration readings were also taken. The XRF readings were taken from various combinations of substrates and components (identified during the survey) including metal doors, steel columns and beams, concrete blocks, and metal railings. A minimum of three XRF readings were collected for each testing combination identified in the survey. XRF data are presented in Section 4.3.6.1. The Lead Paint XRF Investigation report is contained in Appendix M.

TABLE 2-2
ASBESTOS SAMPLE LOCATIONS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Sample No.	Building	Description
20	Boiler Room	Block Boiler Breeching, White/Grey
21	Boiler Room	Block Boiler Breeching, White/Grey
22	Boiler Room	Block Breeching Debris, White
23	Boiler Room	Pipe Fitting Insulation, White
24	Boiler Room	Pipe Fitting Insulation, White/Grey
25	Boiler Room	Pipe Fitting Insulation, White
26	Boiler Room	Pipe Fitting Insulation, White/Grey
27	Boiler Room	Gasket on Boiler Flue, Brown
50	Boiler Room	Roofing Materials, Built-up
49	South Yard	Roof Shingle Debris
13	Decon Shed	Debris
14	Decon Shed	Roofing Paper, Black
19	Maintenance Shed	Gaskets, Misc., Dark Grey
51	No. 33	Transite Panels, Yellow/Green
52	No. 33	Roof Flashing, Black
53	No. 33	Roof Flashing, Black
54	No. 33	Panels in Fume Hood, Grey
55	No. 33	Counter Top, Grey/White
56	No. 33	Lab Counter
57	No. 33	Floor Tile and Mastic, Black/Grey
58	No. 33	Acoustical Ceiling Tiles, Grey
59	No. 33	Board on Closet Wall, White
60	No. 33	Plaster Lathe, White
61	No. 33	Roofing Materials, Built-up, Black/Brown
62	No. 33	Roofing Materials, Built-up, Black
63	No. 33	Magenta Block Insulation
64	No. 33	Debris
65	No. 33	Window Caulking, Black/Green
66	No. 33	Floor Tile and Mastic, Grey
67	No. 33	Roofing Materials
69	No. 33	Acoustical Ceiling Tile, White Swirl
70	No. 33	Pipe Fitting Insulation, White/Grey
71	No. 33	Acoustical Ceiling Panel, White
1	No. 34	Pipe Insulation, White
2	No. 34	Pipe Insulation, Grey
3	No. 34	Debris
4	No. 34	Pipe Insulation, White
5	No. 34	Tank Insulation, Brown
6	No. 34	Tank Insulation, Brown
7	No. 34	Floor Tile, Beige
8	No. 34	Mastic, Black, on Beige Floor Tile
9	No. 34	Gasket Debris, Misc., Grey

TABLE 2-2
ASBESTOS SAMPLE LOCATIONS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Sample No.	Building	Description
10	No. 34	Window Caulking, White/Grey
11	No. 34	Gaskets on Large Tank, Misc., Grey/Brown
15	No. 34	Window Caulking, Block, Grey
16	No. 34	Window Caulking, Black
73	No. 34	Pipe Insulation, Black
74	No. 34	Magenta Block Debris
28	No. 35	Pipe Insulation Wrap, Black
29	No. 35	Window Caulking, Green/Black
30	No. 35	Pipe Insulation, White/Green
31	No. 35	Floor Tile and Mastic, Grey
32	No. 35	Pipe Wrap, Black
33	No. 35	Pipe Insulation, White/Grey
34	No. 35	Pipe Insulation, White
35	No. 35	Debris
36	No. 35	Magenta Block Insulation, White
37	No. 35	Pipe Fitting Insulation, White/Grey
38	No. 35	Pipe Fitting Insulation, White
39	No. 35	Acoustical Ceiling Tiles, White
40	No. 35	Caulking, Black
41	No. 35	Window Putty, White/Pink
42	No. 35	Roof Flashing, Black
43	No. 35	Ceiling Panels, White
44	No. 35	Duct Insulation Gaskets, Black
45	No. 35	Window Caulking, Black/Green
46	No. 35	Roof Flashing, Black
47	No. 35	Roofing Materials, Built-up
48	No. 35	Roofing Materials, Built-up
68	No. 35	Roofing Materials
72	No. 35	Magenta Block Fittings, White
17	Pump House	Transite Debris "B", White
18	Pump House	Roof Flashing, Black

2.4.2.2 Paint Chip Sampling

The action level[2] for lead-based paint in buildings is 1.0 mg/centimeter (cm)^2. Therefore, the manufacturer of the XRF instrument used during the inspection considers readings of 1.0 mg/cm^2 to be inconclusive. When readings of 1.0 mg/cm^2 were obtained, additional readings of the testing combination were taken at a different location on the substrate. If additional testing of the substrate still yielded inconclusive results, paint chip samples were collected for laboratory analysis.

On January 11, 1999, 13 paint chip samples (PB-01 through PB-13) were collected from the on-site buildings; six from Building No. 33, three from Building No. 34, and four from Building No. 35. The locations of the samples are described in Table 2-3.

The paint chip samples were collected using either a decontaminated chisel and hammer or a dedicated natural bristle brush. First, each sampling location was measured and marked off using a 10 cm^2 template. If the paint was already peeling from the sampling surface, the brush was used to scrape the paint from the surface into an airtight bulk sampling bag. If the paint was still intact, the hammer and chisel were used to scrape the paint from the substrate surface directly into airtight bulk sampling bags. All samples were collected in accordance with the sampling procedures described in the FSP. Paint chip data, including sample location maps, are presented in Section 4.3.6.2.

2.4.3 Building Material Sampling

On December 10, 23, and 29, 1998, a survey was conducted to identify potential sample locations for building materials. During the survey, a list of the buildings and the building components was compiled. Building materials that were not included in the survey included areas that were not accessible (e.g., cement foundations, footings); debris components that were difficult to sample (e.g., glass) and/or that only comprised a small percentage of the debris waste stream; and materials that would be separated from the demolition debris for recycling/reuse purposes (e.g., aluminum ductwork). The purpose of the building material sampling was to determine if building debris should be classified as hazardous or non-hazardous under RCRA. This information will be used to support selection of a remedial alternative for the buildings.

Based on the results of the survey, ten samples were collected from the Site buildings from January 22 - 25, 1999; three samples from Building No. 35, four samples from Building No. 34, and three samples from Building No. 33. Materials that were sampled included sheet rock, floor material, cinder block, and red brick. The samples were collected using a drill with a decontaminated masonry bit. All samples were collected to a maximum depth of six inches. Upon receipt, the laboratory pulverized the samples prior to analysis. All samples, which were collected in accordance with the sampling procedures described in the FSP, were analyzed for TCLP parameters. The locations of the samples are described in Table 2-4. Building material analytical data, including sample location maps, are presented in Section 4.3.7.

2.4.4 Wipe Sampling

On December 10, 23, and 29, 1998, a survey was conducted to identify potential wipe sample locations. The locations of the wipe samples were biased toward areas of known hazardous waste storage (e.g., Building No. 33), laboratory areas, and production areas.

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[2]This is the USEPA action level for any type of building (residential or non-residential).

TABLE 2- 3
PAINT CHIP SAMPLE LOCATIONS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Sample No.	Building No.	Description
PB-01	35	Greyish green paint on concrete block wall
PB-02	35	Green paint on plaster
PB-03	35	Green paint on sheet rock above office door
PB-04	35	White paint on concrete block wall
PB-05	33	White paint on concrete block in stairs
PB-06	33	Grey paint on concrete floor
PB-07	33	Peach paint on sheet rock
PB-08	33	Off-white paint on sheet rock
PB-09	33	Peach/Green paint on window sill block
PB-10	33	Peach/Green paint on plaster
PB-11	34	Blue paint on concrete block wall
PB-12	34	Dark green paint on concrete block wall
PB-13	34	Dark green paint on steel wall

TABLE 2-4
BUILDING MATERIAL SAMPLE LOCATIONS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Sample No.	Building No.	Description
BM-TCLP-01	35	West interior cinder block wall
BM-TCLP-02	35	Sheet rock wall
BM-TCLP-03	35	South wall of bathroom area
BM-TCLP-04	34	Floor of chemical storage area
BM-TCLP-05	34	Floor of loading dock
BM-TCLP-06	34	West wall under tank
BM-TCLP-07	34	West wall
BM-TCLP-08	33	Exterior red brick
BM-TCLP-09	33	West wall of garage/tank area
BM-TCLP-10	33	Sheet rock wall of R&D laboratory

Materials that were sampled included tables, laboratory counters, a window ledge, and floors. The purpose of the wipe sampling was to determine the extent and distribution of surface contamination to support selection of a remedial alternative for the buildings.

Fourteen wipe samples were collected from the Site buildings from January 21 - 22, 1999; four samples from Building No. 35, four samples from Building No. 34, and six samples from Building No. 33. The analytical laboratory subsequently determined that insufficient sample volume was collected to complete the mercury and cyanide analyses. Therefore, additional wipe samples were collected (adjacent to the original locations) on January 25, 1999.

The wipe samples were collected by marking off each location with a template, wetting the sample swab with the appropriate solvent (e.g., hexane for the SVOCs, deionized water for the inorganics), and then thoroughly wiping the entire sample area. To determine the amount of sample collected, the sample swab was weighed before and after wiping the sampling area. The samples were collected in accordance with the sampling procedures described in the FSP. All wipe samples were analyzed for TCL SVOCs and Pesticides/PCBs/TAL, including cyanide, total phenols, and PBBs. Although VOC wipe samples were collected, they were not analyzed due to problems with the solvent. The locations of the wipe samples are described on Table 2-5. Wipe sample analytical data, including sample locations maps, are presented in Section 4.3.8.

2.5 SURFACE WATER/SEDIMENT INVESTIGATION

2.5.1 Surface Water Investigation

No perennial surface water bodies exist on the Site and no intermittent surface water bodies were observed between October 1998 and March 1999 when sampling activities were performed. On several occasions, the field team was present during or immediately after a heavy rain event and observed that surface water pooled toward the middle of the property. Sampling was attempted but could not be completed in ditches or swales after a storm event because the accumulated surface water was too shallow to collect a sample.

2.5.2 Sump and Floor Drain Sediment Investigation

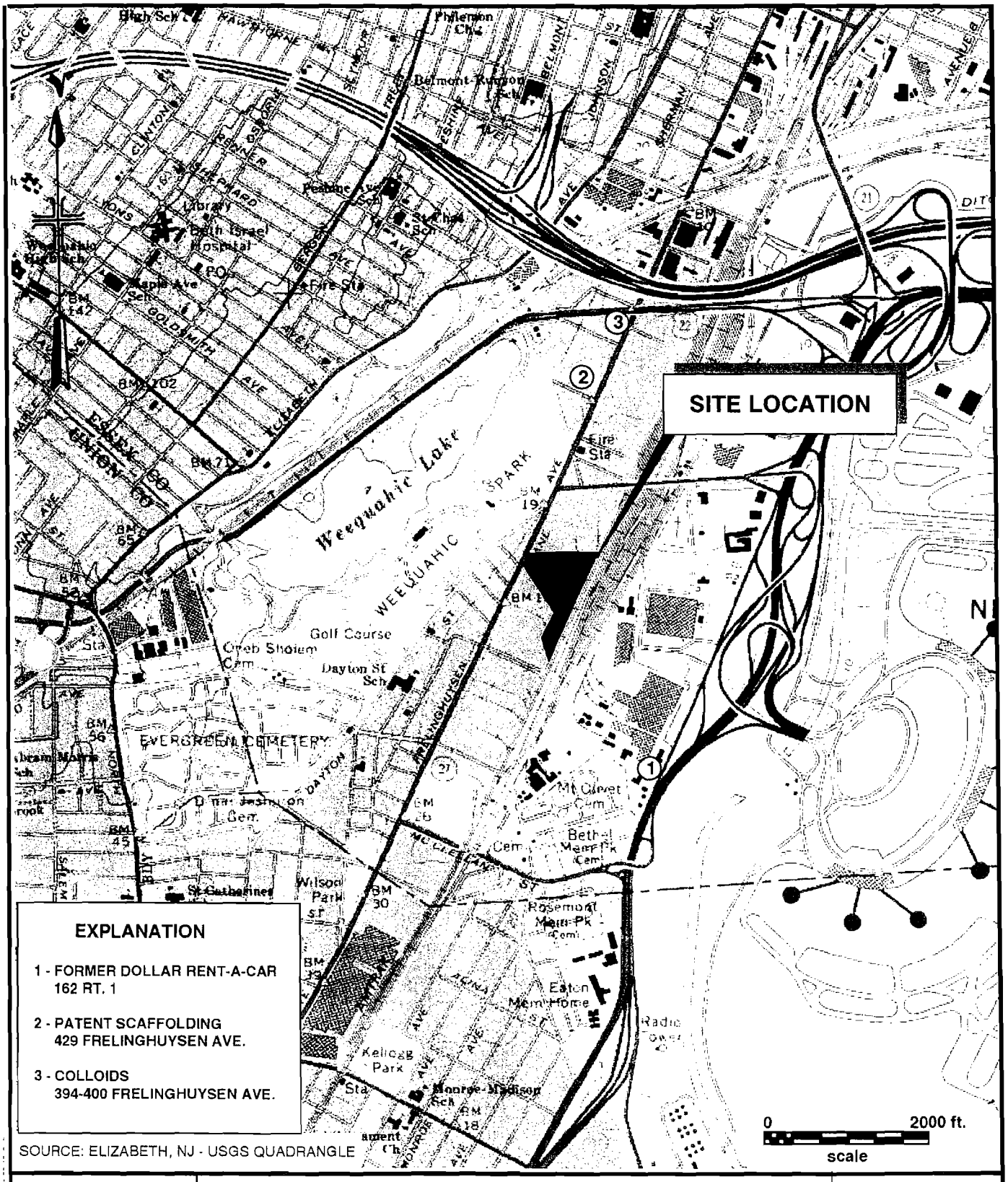
The Work Plan identified a total of six sump or floor drain sample locations. The purpose of the sump and floor drain sampling was to determine what type of materials may have been used in the buildings and if the sumps or floor drains could be potential sources of soil and groundwater contamination.

Two sediment samples were collected on January 19, 1999. The first sample (SD-01) was collected from the floor drain located in Building No. 33 and the second sample (SD-04) was collected from the sump in Building No. 34. The sump in Building No. 33 did not contain sufficient material in the sump to collect a sample. Other proposed sump or floor drain sampling locations were either frozen at the time of sample collection or did not contain sufficient material to collect a sample.

Due to differing depths to the floor drain and sump, two methods were used to collect the samples. Sediment from the floor drain was collected with a trowel and then placed into a bowl while sediment from the sump was collected with a hand auger and then placed into a bowl. At the floor drain location (SD-01), the VOC samples were collected prior to removing any sediment with the trowel. At the sump location (SD-04), the VOC samples were collected from the bowl immediately after the hand auger was emptied. The organic vapor levels of the

TABLE 2-5
BUILDING MATERIAL WIPE SAMPLE LOCATIONS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Sample No.	Building No.	Description
BM-WIPE-01	35	Composite of table and wall
BM-WIPE-02	35	Window ledge
BM-WIPE-03	35	Sheet rock wall
BM-WIPE-04	35	Composite of concrete block wall and door
BM-WIPE-05	34	Composite of wall, tank and floor
BM-WIPE-06	34	Concrete floor
BM-WIPE-07	34	Concrete floor near railing
BM-WIPE-08	34	Steel wall
BM-WIPE-09	33	Laboratory counter top
BM-WIPE-10	33	Laboratory counter top
BM-WIPE-11	33	Laboratory counter top
BM-WIPE-12	33	Concrete wall
BM-WIPE-13	33	Concrete wall
BM-WIPE-14	33	Concrete wall



SOURCE: ELIZABETH, NJ - USGS QUADRANGLE

MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

ECRA SITE LOCATION MAP

MALCOLM PIRNIE, INC.

FIGURE 4-1

4.3 SAMPLED MEDIA

The following section summarizes the nature and extent of contamination in each medium sampled. In the surface and subsurface soil subsections, laboratory analytical data from all applicable sampling locations (i.e., test pits, surface soils, and soil borings) are presented together. The vertical extent of the selected contaminants in soils have been grouped into surface (0 to 2 feet) and subsurface (greater than 2 feet)[4] soils.

As is detailed below, soil contamination is present throughout the Site; however, the majority of the contamination is present at the surface (top two feet). A review of the contaminant concentrations detected near the Site boundaries was conducted to determine if contamination appeared to be migrating off-Site. Elevated levels of contamination were found in the surface soil near the southwestern Site boundary. However, this area represents a topographic low spot and it is likely that soil contamination would migrate vertically not horizontally from this area. Therefore, it is likely that any off-Site migration of soil contamination is insignificant.

The majority of the contamination at the Site is the result of the improper staging, control and maintenance of process chemicals contained in drums, laboratory chemical containers, storage tanks and process tanks. Chemicals found at the property include flammable liquids, corrosives, acids, oxidizers, shock-sensitive material, and air/water-reactive substances. A partial summary of the drummed chemicals and wastes that were removed from the WCC Site during the USEPA removal action in 1990-1991 is presented in Table 4-6.

4.3.1 Surface Soil

4.3.1.1 Volatile Organic Compounds

Analysis of 109 surface soil samples indicated the presence of 23 VOCs; however, only 13 were detected at concentrations that exceeded the TBCs. These include chlorinated compounds (1,1,2,2,-tetrachloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane, carbon tetrachloride, methylene chloride, tetrachloroethene, cis-1,2-dichloroethene, trichloroethene, and vinyl chloride) and hydrocarbons (benzene, ethylbenzene, m,p-xylene, and o-xylene). Three primary areas at the Site contain surface soil VOC contamination above the TBCs: the northeast corner (between the warehouse and the eastern and northern Site boundaries); the southeast corner (near the southeastern Site boundary); and the center of the Site (between the former AST farm and Building No. 34). No trend regarding locations of specific classes of compounds was found. A map showing the locations of VOCs in surface soil above the TBCs is presented in Plate 3. A tabular summary of VOCs detected in surface soil is presented in Table 4-7.

1,1,2,2-Tetrachloroethane was detected in 24 samples at concentrations ranging from 93 J µg/kg to 28,000 µg/kg, all of which exceeded the USEPA SSL guidance value of 3 µg/kg. Nine of these samples also exceeded the NJDEP SCC (1,000 µg/kg). 1,1,2-trichloroethane was

[4] Approximately 80 percent (87 of 109 locations) of all surface soil or soil boring locations at the Site were covered with at least one foot of impermeable material, usually asphalt or concrete. The depth of the sample below this impermeable material was used to classify that sample as a surface soil or a subsurface soil. For example, a soil boring sample collected immediately below a one-foot thick asphalt layer was labeled 0-2 feet and classified as a surface soil sample. The first sample from another soil boring location that was not covered with asphalt was collected from 0-2 feet and was also classified as *a* surface soil sample.

TABLE 4-6
PARTIAL SUMMARY OF CHEMICALS AND WASTES REMOVED FROM SITE (1990-1991)
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Valeryl Chloride	Boiler Treatment Chemical	Spent Sulfuric Acid
Lauroyl Chloride	Provalyl Chloride	Flame Retardants
Butroyl Chloride	Methyl Butyrate	C_8Cl
Caproyl Chloride (Hexanoyl Chloride)	Allyl Bromide	Fatty Acids
Isanaonoyl Chloride	Butyric Acid	Bromide
Valeric Acid	Assorted Acid Chlorides	Lab Waste
Phenyl Ethyl Bromide (2-bromoethyl benzene)	Hysol Solvent	Hydriatic Acid
Pivaloyl Chloride (Trimethylacetyl Chloride)	Ethyl Glycol	EDC Ethylene Dichloride
Surfuric Water	Waste Oil	Pentanol Water
Isopropyl Bromide (2-bromopropane)	Hydrochloric Acid	Hexal Bromide
Heptanoyl Chloride	Water scubbing solution (TCE/water and Xylene/water)	Sulfuric Acid
Acetic Acid	Pilot Plant Chemicals	Propionic Acid
Adipoyl Chloride	Phosphorous Acid	Isopropanol (virgin)
Benzyl Bromide	Hypo Phosphorous Acid	Phenethyl Alcohol
Acetone	Propenoyl Chloride	Diamonios Phosphate
Bufuralol	Xylene	Ammonia
Bromo Acetic Acid	Hydrogen Bromide	Diphenyl Oxide
Bromo Acetal Bromide	Decanoyl Chloride	Dimethyl Oxalate
Toluene	Water Treatment Chemicals	Hexenayl Chloride
Stearoyl Bromide	DPX Filter Cakes	Caprylic Acid
Trimethanylamine, anhydrous	Methanol	Methylene Chloride

TABLE 4-7
SUMMARY OF VOCs DETECTED IN SOIL, SEDIMENT, AND GROUNDWATER
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

VOCs Detected	Surface Soil	Above TBCs	Subsurface Soil	Above TBCs	Sump Sediment	Above TBCs	Groundwater	Above ARARs
1,1,1-Trichloroethane	✔						✔	
1,1,2,2-Tetrachloroethane	✔	Yes	✔	Yes	✔	Yes	✔	Yes
1,1,2- Trichloroethane	✔	Yes	✔	Yes	✔	Yes	✔	Yes
1,1-Dichloroethane							✔	
1,1-Dichloroethene							✔	Yes
1,2-Dichloroethane	✔	Yes	✔	Yes	✔	Yes	✔	Yes
1,2-Dichloropropane					✔	Yes		
2-Butanone	✔		✔					
2-Hexanone	✔							
4-Methyl-2-pentanone			✔					
Acetone	✔		✔					
Benzene	✔	Yes						
Bromoform	✔							
Carbon disulfide	✔							
Carbon tetrachloride	✔	Yes						
Chlorobenzene	✔							
Chloroform							✔	
Ethylbenzene	✔	Yes	✔		✔	Yes		
m,p-xylene	✔	Yes	✔		✔	Yes		
Methylene chloride	✔	Yes			✔	Yes	✔	Yes
o-xylene	✔	Yes	✔		✔	Yes		
Styrene	✔							
Tetrachloroethene	✔	Yes	✔	Yes	✔	Yes	✔	Yes
Toluene	✔		✔				✔	
cis-1,2-Dichloroethene	✔	Yes	✔	Yes	✔	Yes	✔	Yes
trans-1,2-Dichloroethene	✔				✔	Yes	✔	Yes
Trichloroethene	✔	Yes	✔	Yes	✔	Yes	✔	Yes
Vinyl chloride	✔	Yes					✔	Yes

Note:

The groundwater results are from both rounds of groundwater sampling.

detected in 11 samples at concentrations ranging from 110 J µg/kg to 1,400 µg/kg, all of which exceeded the USEPA SSL guidance value of 20 µg/kg. One sample also exceeded the NJDEP SCC (1,000 µg/kg). 1,2-Dichloroethane was detected in 44 samples at concentrations ranging from 71 J µg/kg to 31,000 E µg/kg and exceeded the USEPA SSL (20 µg/kg) in 24 samples. Fourteen of these samples also exceeded the NJDEP SCC (1,000 µg/kg). Carbon tetrachloride was found in one sample at a concentration of 190 J µg/kg, which exceeded the USEPA SSL of 70 µg/kg. Methylene chloride was found in one sample at a concentration of 900 µg/kg, which exceeded the USEPA SSL of 20 µg/kg. Tetrachloroethene was detected in six samples at concentrations ranging from 70 J µg/kg to 5,400 µg/kg, all of which exceeded the USEPA SSL (60 µg/kg). Three of these samples also exceeded the NJDEP SCC (1,000 µg/kg). Cis-1,2-dichloroethene was detected in 21 samples at concentrations ranging from 85 J µg/kg to 3,600 µg/kg and exceeded the USEPA SSL (400 µg/kg) in four samples. Three of these samples also exceeded the NJDEP SCC (1,000 µg/kg). Trichloroethene was detected in 45 samples at concentrations ranging from 77 J µg/kg to 130,000 µg/kg, all of which exceeded the USEPA SSL (60 µg/kg). Eight of these samples also exceeded the NJDEP SCC (1,000 µg/kg). Vinyl chloride was detected in six samples at concentrations ranging from 85 J µg/kg to 600 J µg/kg, all of which exceeded the USEPA SSL of 10 µg/kg.

Benzene was found in one sample at a concentration of 140 J µg/kg, which exceeded the USEPA SSL of 30 µg/kg. Ethylbenzene was detected in 27 samples at concentrations ranging from 88 J µg/kg to 130,000 E µg/kg and exceeded the USEPA SSL (13,000 µg/kg) in five samples. Three of these samples also exceeded the NJDEP SCC (100,000 µg/kg). m,p-Xylene was detected in 29 samples at concentrations ranging from 80 J µg/kg to 500,000 E µg/kg and exceeded the NJDEP SCC (67,000 µg/kg) in two samples. One sample also exceeded the USEPA SSL (200,000 µg/kg). o-Xylene was detected in 28 samples at concentrations ranging from 75 J µg/kg to 260,000 E µg/kg and exceeded both the USEPA SSL (190,000 µg/kg) and the NJDEP SCC (67,000 µg/kg) in one sample.

Additional VOCs that were detected in the surface soils at concentrations below the TBCs include 1,1,1-trichloroethane, 2-butanone, 2-hexanone, acetone, bromoform, carbon disulfide, chlorobenzene, trans-1,2-dichloroethene, styrene, and toluene.

4.3.1.2 Semi-Volatile Organic Compounds

Analysis of 109 surface soil samples indicated the presence of 37 SVOCs; however, only 12 were detected at concentrations that exceeded the TBCs. These include aromatic compounds, most notably polycyclic aromatic hydrocarbons (PAHs) (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, fluoranthene, and carbazole) as well as chlorinated hydrocarbons (pentachlorophenol, hexachlorobenzene, and hexachloroethane). Three primary areas at the Site contain surface soil SVOC contamination above the TBCs; the northern section (between the gate and the eastern Site boundary), the southeast corner (south of the concrete tank pad connected to Building No. 35), and the center of the Site (between Building Nos. 34 and 35). No trend regarding locations of specific classes of compounds was found. A map showing the locations of SVOCs in surface soil above the TBCs is presented in Plate 4. A tabular summary of SVOCs detected in surface soil is presented in Table 4-8.

Benzo(a)anthracene was detected in 74 samples at concentrations ranging from 20 J µg/kg to 36,000 E µg/kg and exceeded the USEPA SSL (900 µg/kg) in ten samples. Four of

TABLE 4-8
SUMMARY OF SVOCs DETECTED IN SOIL, SEDIMENT, AND GROUNDWATER
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

SVOCs Detected	Surface Soil	Above TBCs	Subsurface Soil	Above TBCs	Sump Sediment	Above TBCs	Groundwater	Above ARARs
1,2-Dichlorobenzene	✔		✔					
1,4-Dichlorobenzene	✔		✔					
1,2,4-Trichlorobenzene			✔					
2,2'-oxybis(1-Chloropropane)	✔		✔				✔	
2,4-Dimethylphenol	✔						✔	
2,4-Dinitrophenol	✔							
2-Chloronaphthalene							✔	
2-Methylnaphthalene	✔		✔					
2-Methylphenol	✔							
4-Bromophenyl-phenyl ether	✔				✔			
4-Methylphenol	✔		✔					
Acenaphthene	✔		✔		✔		✔	
Acenaphthylene	✔		✔					
Anthracene	✔		✔		✔		✔	
Benzo(a)anthracene	✔	Yes	✔	Yes	✔	Yes	✔	
Benzo(a)pyrene	✔	Yes	✔	Yes	✔	Yes		
Benzo(b)fluoranthene	✔	Yes	✔	Yes	✔	Yes		
Benzo(g,h,i)perylene	✔		✔		✔			
Benzo(k)fluoranthene	✔	Yes	✔		✔			
Bis(2-ethylhexyl)phthalate	✔		✔		✔			
Butylbenzylphthalate	✔		✔				✔	
Carbazole	✔	Yes	✔	Yes	✔	Yes	✔	
Chrysene	✔		✔		✔		✔	
Dibenz(a,h)anthracene	✔	Yes	✔	Yes	✔	Yes		
Dibenzofuran	✔		✔				✔	
Diethylphthalate	✔		✔				✔	
Dimethylphthalate							✔	
Di-n-butylphthalate	✔		✔		✔			
Di-n-octylphthalate	✔				✔			
Fluoranthene	✔	Yes	✔		✔		✔	
Fluorene	✔		✔		✔		✔	
Hexachlorobenzene	✔	Yes			✔			
Hexachloroethane	✔	Yes			✔	Yes		
Indeno(1,2,3-cd)pyrene	✔	Yes	✔	Yes	✔			
Naphthalene	✔	Yes	✔		✔		✔	
N-nitrosodiphenylamine	✔		✔					
Pentachlorophenol	✔	Yes						
Phenanthrene	✔		✔		✔		✔	
Phenol	✔		✔		✔		✔	
Pyrene	✔		✔		✔		✔	

Note:

The groundwater results are from both rounds of groundwater sampling.

these samples also exceeded the NJDEP SCC (4,000 µg/kg). Benzo(a)pyrene was detected in 73 samples at concentrations ranging from 23 J µg/kg to 25,000 E µg/kg and exceeded the USEPA SSL (90 µg/kg) in 42 samples. Seventeen of these samples also exceeded the NJDEP SCC (660 µg/kg). Benzo(b)fluoranthene was detected in 75 samples at concentrations ranging from 20 J µg/kg to 21,000 E µg/kg and exceeded the USEPA SSL (900 µg/kg) in ten samples. Four of these samples also exceeded the NJDEP SCC (4,000 µg/kg). Benzo(k) fluoranthene was detected in 70 samples at concentrations ranging from 22 J µg/kg to 20,000 E µg/kg and exceeded the NJDEP SCC (4,000 µg/kg) in four samples. One of these samples also exceeded the USEPA SSL (9,000 µg/kg). Dibenz(a,h)anthracene was detected in 38 samples at concentrations ranging from 23 J µg/kg to 4,400 J µg/kg and exceeded the USEPA SSL (90 µg/kg) in 20 samples. Four of these samples also exceeded the NJDEP SCC (660 µg/kg). Indeno(1,2,3-cd)pyrene was detected in 66 samples at concentrations ranging from 20 J µg/kg to 13,000 E µg/kg and exceeded the USEPA SSL (900 µg/kg) in ten samples. Four of these samples also exceeded the NJDEP SCC (4,000 µg/kg). Naphthalene was detected in 30 samples at concentrations ranging from 20 J µg/kg to 480,000 E µg/kg and exceeded both the USEPA SSL (84,000 µg/kg) and the NJDEP SCC (100,000 µg/kg) in one sample. Fluoranthene was detected in 81 samples at concentrations ranging from 22 J µg/kg to 160,000 E µg/kg and exceeded the NJDEP SCC (100,000 µg/kg) in one sample. Carbazole was detected in 26 samples at concentrations ranging from 21 J µg/kg to 29,000 E µg/kg and exceeded the USEPA SSL (600 µg/kg) in five samples. There is no NJDEP SCC for this compound.

Pentachlorophenol was detected in 3 samples at concentrations ranging from 66 J µg/kg to 110 J µg/kg, all of which exceeded the USEPA SSL of 30 µg/kg. Hexachlorobenzene was detected in four samples at concentrations ranging from 23 J µg/kg to 560 J µg/kg and exceeded the USEPA SSL (400 µg/kg) in one sample. Hexachloroethane was detected in seven samples at concentrations ranging from 26 J µg/kg to 35,000 µg/kg and exceeded the USEPA SSL (500 µg/kg) in three samples.

Additional SVOCs that were detected in the surface soils at concentrations below the TBCs include 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2,2'-oxybis(1-Chloropropane), 2,4-dimethylphenol, 2,4-dinitrophenol, 2-methylnaphthalene, 2-methylphenol, 4-bromophenyl-phenyl ether, 4-methylphenol, acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, chrysene, dibenzofuran, diethylphthalate, di-n-butylphthalate, di-n-octylphthalate, fluorene, n-nitrosodiphenylamine, phenanthrene, phenol, and pyrene.

4.3.1.3 Pesticides/PCBs

Analysis of 109 surface soil samples indicated the presence of 21 pesticides and total PCBs; however, only nine were detected at concentrations that exceeded the TBCs. These compounds, which are all chlorinated, include alpha-BHC, beta-BHC, gamma-BHC, 4,4'-DDD, aldrin, dieldrin, heptachlor, heptachlor epoxide, and PCBs (total). Pesticide/PCB contamination at concentrations above the TBCs is present on the eastern portion of the Site. A map showing the locations of pesticides/PCBs in surface soil above the TBCs is presented in Plate 5. A tabular summary of pesticides/PCBs in surface soil is presented in Table 4-9.

Alpha-BHC was detected in one sample at a concentration of 2.4 E µg/kg, which is above the USEPA SSL of 0.5 µg/kg. There is no NJDEP SCC for this compound. Beta-BHC was detected in one sample at a concentration of 6 EN µg/kg, which is above the USEPA SSL of 3

TABLE 4-9
SUMMARY OF PESTICIDES/PCBs DETECTED IN SOIL, SEDIMENT, AND GROUNDWATER
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Pesticides/PCBs Detected	Surface Soil	Above TBCs	Subsurface Soil	Above TBCs	Sump Sediment	Above TBCs	Groundwater	Above ARARs
4,4'-DDD	✔	Yes	✔		✔	Yes	✔	
4,4'-DDE	✔		✔		✔		✔	
4,4'-DDT	✔		✔					
Aldrin	✔	Yes			✔	Yes	✔	
alpha-BHC	✔	Yes	✔		✔	Yes		
alpha-Chlordane	✔		✔		✔	Yes	✔	
PCBs (total)	✔	Yes	✔				✔	
beta-BHC	✔	Yes						
delta-BHC	✔				✔			
Dieldrin	✔	Yes	✔	Yes	✔	Yes	✔	
Endosulfan I	✔							
Endosulfan II	✔		✔				✔	
Endosulfan sulfate	✔				✔			
Endrin	✔		✔		✔			
Endrin aldehyde	✔		✔		✔		✔	
Endrin ketone	✔		✔		✔			
gamma-BHC	✔	Yes	✔		✔	Yes		
gamma-Chlordane	✔		✔		✔	Yes	✔	
Heptachlor	✔	Yes	✔		✔	Yes		
Heptachlor epoxide	✔	Yes					✔	
Methoxychlor	✔		✔		✔			

Note:

The groundwater results are from both rounds of groundwater sampling.

µg/kg. There is no NJDEP SCC for this compound. Gamma-BHC was detected in four samples at concentrations ranging from 0.56 J µg/kg to 50 E µg/kg and exceeded the USEPA SSL (9 µg/kg) in two samples. 4,4'-DDD was detected in 19 samples at concentrations ranging from 1.2 J µg/kg to 18,000 µg/kg and exceeded both the USEPA SSL (3,000 µg/kg) and the NJDEP SCC (12,000 µg/kg) in one sample. Aldrin was detected in four samples at concentrations ranging from 1.9 µg/kg to 180 E µg/kg and exceeded the USEPA SSL (40 µg/kg) in two samples. One of these samples also exceeded the NJDEP SCC (170 µg/kg).

Dieldrin was detected in five samples at concentrations ranging from 10 E µg/kg to 240 EN[5] µg/kg, all of which exceeded the USEPA SSL of 4 µg/kg. One sample also exceeded the NJDEP SCC of 180 µg/kg. Heptachlor was detected in nine samples at concentrations ranging from 1.1 J µg/kg to 400 E µg/kg and exceeded the USEPA SSL (100 µg/kg) in two samples. Heptachlor epoxide was detected in four samples at concentrations ranging from 1.7 J µg/kg to 94 E µg/kg and exceeded the USEPA SSL (70 µg/kg) in one sample. There is no NJDEP SCC for this compound. PCBs (total) were detected in 28 samples at concentrations ranging from 20 J µg/kg to 13,000 µg/kg and exceeded both the USEPA SSL (1,000 µg/kg) and the NJDEP SCC (2,000 µg/kg) in three samples.

Each soil sample was analyzed for seven different PCB congeners; however, both TBCs for PCBs are based on total PCBs. To determine if the PCBs exceeded the TBCs, the concentration of each congener was added together. At this Site, the only congener present at significant concentrations is Aroclor-1254.

Additional pesticides that were detected in the surface soils at concentrations below the TBCs include 4,4'-DDE, 4,4'-DDT, alpha-chlordane, delta-BHC, endosulfan I, endosulfan II, endosulfan sulfate, endrin, endrin aldehyde, endrin ketone, gamma-chlordane, and methoxychlor.

4.3.1.4 Polybrominated Biphenyls

Analysis of 23 surface soil samples indicated the presence of detectable levels of PBBs in nine samples at concentrations ranging from 0.28 nanograms per gram (ng/g) to 190 ng/g. TBCs for PBBs[6] include the NJDEP NRDCSCC of 320 ng/g and the USEPA Region 3 non-residential SSL of 640 ng/g. Although a limited number of surface soil samples were analyzed for PBBs, these samples provided spatial coverage over a majority of the Site. PBB contamination was not limited to any one portion of the property, but was found throughout the Site. Also as described previously in Section 1.3.4, the 1998 ERT investigation (Appendix C) found PBBs at concentrations in the surface soil and sump sediment ranging from 0.7 to 5,043 ng/g. A map showing the locations of PBBs in surface soil is presented in Plate 6.

4.3.1.5 Inorganics

Analysis of 109 surface soil samples indicated the presence of all TAL metals and cyanide; however, only 11 metals (arsenic, beryllium, antimony, cadmium, chromium, copper, lead, mercury, nickel, thallium, and zinc) were detected at concentrations that exceeded both the

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[5]EN - estimated value, presumptive evidence of the presence of this compound.

[6]NJDEP non-residential direct contact cleanup criteria for PBBs uses a soil ingestion rate of 100 mg/day in its risk calculation. The USEPA Region 3 uses a 50 mg/day soil ingestion rate. There are no USEPA Region 2 ARARs/TBCs for PBBs; USEPA Region 9 has a Preliminary Remediation Goal (PRG) of 280 ng/g.

TBCs and the average background concentrations. There are no USEPA SSL values for copper. Inorganics in the surface soil were found throughout the Site. A map showing the locations of inorganics in surface soil above the TBCs is presented in Plate 7. A tabular summary of inorganics detected in surface soil is presented in Table 4-10.

Arsenic and beryllium were detected in the surface soil samples at concentrations that exceeded the TBCs. Arsenic was found in 106 samples at concentrations that exceeded the USEPA SSL (0.4 mg/kg), in six samples that exceeded the NJDEP SCC (20 mg/kg); and in 94 samples that exceeded the Site-specific background concentration (2.1 mg/kg). The arsenic concentrations detected ranged from 1.1 J mg/kg to 279 mg/kg. Beryllium exceeded the USEPA SSL (0.1 mg/kg) in all 106 samples, but did not exceed the NJDEP SCC (100 mg/kg) in any sample. The beryllium concentrations detected ranged from 0.23 J mg/kg to 1 mg/kg. Eighty-seven of these samples also exceeded the Site-specific background concentration (0.44 mg/kg).

Copper, chromium, lead, mercury, nickel, and zinc were also found in the majority of the surface soil samples; however, most of the samples were below the TBC concentrations. Copper was detected in 101 samples at concentrations ranging from 5.1 J mg/kg to 39,900 mg/kg and exceeded both the NJDEP SCC (600 mg/kg) and the Site-specific background concentration (17.3 mg/kg) in 11 samples. Chromium was detected in all of the samples at concentrations ranging from 7.3 mg/kg to 270 mg/kg and exceeded both the USEPA SSL (38 mg/kg) and the Site-specific background concentration (13.8 mg/kg) in eight samples. Lead was detected in 103 samples at concentrations ranging from 5 mg/kg to 820 mg/kg and exceeded both the USEPA SSL (400 mg/kg) and the Site-specific background concentration (7.2 mg/kg) in seven samples. Six of these samples also exceeded the NJDEP SCC (600 mg/kg). Mercury was detected in 66 samples at concentrations ranging from 0.075 mg/kg to 104 mg/kg and exceeded the USEPA SSL (2 mg/kg) in six samples. This metal was not detected in the Site-specific background samples. Nickel was detected in all of the samples at concentrations ranging from 6.3 J mg/kg to 458 mg/kg and exceeded both the USEPA SSL (130 mg/kg) and the Site-specific background concentration (16.2 mg/kg) in two samples. Zinc was detected in all of the samples at concentrations ranging from 24.6 E mg/kg to 7,050 mg/kg and exceeded both the NJDEP SCC (1,500 mg/kg) and the Site-specific background (43.1 mg/kg) in three samples.

Antimony, cadmium, and thallium were found in less than half of the samples and the majority of the samples had concentrations that were below the TBC concentrations. Antimony was detected in 44 samples at concentrations ranging from 0.78 J mg/kg to 720 mg/kg and exceeded the USEPA SSL (5 mg/kg) in 11 samples. One sample also exceeded the NJDEP SCC (340 mg/kg). This metal was not detected in the Site-specific background samples. Cadmium was detected in 41 samples at concentrations ranging from 0.12 J mg/kg to 11.4 mg/kg and exceeded the USEPA SSL (8 mg/kg) in one sample. This metal was also not detected in the Site-specific background samples. Thallium was detected in 32 samples at concentrations ranging from 0.43 J mg/kg to 3.5 mg/kg and exceeded both the USEPA SSL (0.7 µg/kg) and the Site-specific background concentration (0.94 µg/kg) in 16 samples. One of these samples also exceeded the NJDEP SCC (2 mg/kg).

4.3.1.6 TCLP Parameters

Analysis of 20 surface soil samples for TCLP parameters (VOCs, SVOCs, pesticides, herbicides, and metals) indicated the presence of VOCs, pesticides, herbicides, and metals. The majority of the compounds/analytes were detected at trace levels (i.e., well below the RCRA

TABLE 4-10
SUMMARY OF INORGANICS DETECTED IN SOIL, SEDIMENT, AND GROUNDWATER
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Inorganics Detected	Surface Soil	Above TBCs	Subsurface Soil	Above TBCs	Sump Sediment	Above TBCs	Groundwater	Above ARARs
Aluminum	✔		✔		✔		✔	Yes
Antimony	✔	Yes	✔		✔	Yes	✔	Yes
Arsenic	✔	Yes	✔	Yes	✔	Yes	✔	
Barium	✔		✔		✔		✔	
Beryllium	✔	Yes	✔	Yes	✔	Yes		
Cadmium	✔	Yes	✔		✔		✔	Yes
Calcium	✔		✔		✔		✔	
Chromium	✔	Yes	✔		✔	Yes	✔	
Cobalt	✔		✔		✔		✔	
Copper	✔	Yes	✔		✔		✔	
Iron	✔		✔		✔		✔	Yes
Lead	✔	Yes	✔		✔		✔	Yes
Magnesium	✔		✔		✔		✔	
Manganese	✔		✔		✔		✔	Yes
Mercury	✔	Yes	✔		✔	Yes		
Nickel	✔	Yes	✔		✔		✔	
Potassium	✔		✔		✔		✔	
Selenium	✔		✔				✔	
Silver	✔		✔				✔	
Sodium	✔		✔		✔		✔	Yes
Thallium	✔	Yes	✔	Yes			✔	Yes
Vanadium	✔		✔		✔		✔	
Zinc	✔	Yes	✔		✔		✔	
Cyanide	✔		✔				✔	

Note:

The groundwater results are from both rounds of groundwater sampling.

regulatory limits); however, one VOC (trichloroethene) was detected at a concentration that exceeded the ARAR. Trichloroethene was detected in 11 samples at concentrations ranging from 0.6 J µg/l to 580 µg/l and exceeded the RCRA regulatory limit (500 µg/l) in one sample (SB-15-01 - 580 µg/l). This sample is located north of the alleyway between Buildings No. 34 and 34A. A map showing the location of this sample is presented in Plate 6. Based on these results, the majority of the samples would not be characterized as a RCRA hazardous waste.

Additional TCLP compounds/analytes that were detected in the surface soils at concentrations below the ARARs include VOCs (vinyl chloride, 1,2-dichloroethane, 2-butanone, benzene, and tetrachloroethene), pesticides (gamma-BHC, heptachlor, endrin, and methoxychlor), a herbicide (2,4-D), and metals (barium, chromium, and lead).

4.3.1.7 Dioxins

Analysis of 11 surface soil samples indicated the presence of detectable levels of dioxins in all the samples; however, none were detected at concentrations that exceeded the TBC[7]. The normalized values detected ranged from 0.00 ng/kg to 50.87 ng/kg. Although a limited number of surface soil samples were analyzed for dioxins, these samples provide spatial coverage of the majority of the Site.

4.3.2 Subsurface Soil

4.3.2.1 Volatile Organic Compounds

Analysis of 63 subsurface soil samples indicated the presence of 13 VOCs; however, only six were detected at concentrations that exceeded the TBCs. These compounds, which are all chlorinated, include 1,1,2,2-tetrachloroethane, 1,2-dichloroethane, 1,1,2-trichloroethane, cis-1,2-dichloroethene, tetrachloroethene, and trichloroethene. Subsurface soil VOC contamination at concentrations above the TBCs was primarily found near the eastern/northeastern Site boundary. One location north of the concrete tank pad connected to Building No. 35 also exhibited subsurface VOC contamination at a concentration above the TBCs. A map showing the locations of subsurface soil samples containing VOCs above the TBCs, as well as the compounds and concentrations detected in these samples, is presented in Plate 8. A tabular summary of the VOCs in subsurface soil is presented in Table 4-7.

1,1,2,2-Tetrachloroethane was detected in nine samples at concentrations ranging from 95 J µg/kg to 4,300 µg/kg, all of which exceeded the USEPA SSL (3 µg/kg). Three of these samples also exceeded the NJDEP SCC (1,000 µg/kg). This compound was detected at a maximum depth of ten feet. 1,2-Dichloroethane was detected in ten samples at concentrations ranging from 120 J µg/kg to 43,000 µg/kg, all of which exceeded the USEPA SSL (20 µg/kg). Three of these samples also exceeded the NJDEP SCC (1,000 µg/kg). This compound was detected at a maximum depth of 11.5 feet. 1,1,2-Trichloroethane was detected in two samples at concentrations of 140 J µg/kg and 300 J µg/kg; both of these concentrations exceed the USEPA SSL of 20 µg/kg. This compound was detected at a maximum depth of six feet.

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[7]There are no USEPA SSL or NJDEP SCC values for dioxin. The value used for this report was obtained from an ATSDR Interim Policy Guideline (1997) which states that when the dioxin congeners have been normalized to 2,3,7,8-TCDD using WHO TEFs, the action level is 1 µg/kg. This action level is used to evaluate the health implications of residential exposure to dioxin and dioxin-like compounds. Although this Site is not in a residential area, this value was used as a conservative measure since no other action levels were available.

cis-1,2-Dichloroethene was detected in three samples at concentrations ranging from 210 J µg/kg to 900 µg/kg and exceeded the USEPA SSL (400 µg/kg) in two samples. This compound was found at a maximum depth of eight feet. Tetrachloroethene was detected in one sample at a concentration of 110 J µg/kg; this concentration exceeded the USEPA SSL of 60 µg/kg. This sample was collected from a depth of 4 feet. Trichloroethene was detected in 17 samples at concentrations ranging from 78 J µg/kg to 6,100 µg/kg, all of which exceeded the USEPA SSL (60 µg/kg). Two of these samples also exceeded the NJDEP SCC (1,000 µg/kg). This compound was detected at a maximum depth of 12 feet.

Additional VOCs that were detected in the subsurface soils at concentrations below the TBCs include 2-butanone, 4-methyl-2-pentanone, acetone, ethylbenzene, m,p-xylene, o-xylene, and toluene.

4.3.2.2 Semi-Volatile Organic Compounds

Analysis of 63 subsurface soil samples indicated the presence of 30 SVOCs; however, only six were detected at concentrations that exceeded the TBCs. These compounds, which are all aromatic compounds, include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and carbazole. Subsurface soil SVOC contamination at concentrations above the TBCs was primarily found near the center of the Site. One location near the northeast corner of the property also exhibited subsurface SVOC contamination at a concentration above the TBCs. A map showing the locations of SVOCs in subsurface soil above the TBCs is presented in Plate 9. A tabular summary of SVOCs in subsurface soil is presented in Table 4-8.

Benzo(a)anthracene was detected in eight samples at concentrations ranging from 28 J µg/kg to 4,100 E µg/kg and exceeded the USEPA SSL (900 µg/kg) in three samples. One of these samples also exceeded the NJDEP SCC (4,000 µg/kg). Benzo(a)pyrene was detected in eight samples at concentrations ranging from 27 J µg/kg to 2,000 J µg/kg and exceeded both the USEPA SSL (90 µg/kg) and the NJDEP SCC (660 µg/kg) in four samples. Benzo(b)fluoranthene was detected in seven samples at concentrations ranging from 22 J µg/kg to 2,700 E µg/kg and exceeded the USEPA SSL (900 µg/kg) in two samples. Dibenz(a,h)anthracene was detected in three samples at concentrations ranging from 160 J µg/kg to 720 J µg/kg and exceeded the USEPA SSL (90 µg/kg) in three samples. Indeno(1,2,3-cd)pyrene was detected in seven samples at concentrations ranging from 25 J µg/kg to 1,100 J µg/kg and exceeded the USEPA SSL (900 µg/kg) in two samples. Carbazole was detected in three samples at concentrations ranging from 420 µg/kg to 1,100 J µg/kg and exceeded the USEPA SSL (600 µg/kg) in two samples. There is no NJDEP SCC for this compound. All of these compounds were found at a maximum depth of ten feet.

Additional SVOCs that were detected in the subsurface soils at concentrations below the TBCs include 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2,2'-oxybis(1-Chloropropane), 2-methylnaphthalene, 4-methylphenol, acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, chrysene, dibenzofuran, diethylphthalate, di-n-butylphthalate, fluoranthene, fluorene, naphthalene, n-nitrosodiphenylamine, phenanthrene, phenol, and pyrene.

4.3.2.3 Pesticides/PCBs

Analysis of 63 subsurface soil samples indicated the presence of 15 pesticides/PCBs; however, only one was detected at a concentration that exceeded the TBCs. Dieldrin, which is a chlorinated compound, was detected in two samples at concentrations ranging from 0.82 J µg/kg to 8 E µg/kg and exceeded the USEPA SSL (5 µg/kg) in one sample. This sample was collected at a depth of four feet. A map showing the location of the soil sample containing dieldrin above the TBC is presented in Plate 5. A summary of pesticides/PCBs in subsurface soil is presented in Table 4-9. Additional pesticides/PCBs that were detected in the subsurface soils at concentrations below the TBCs include 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-BHC, alpha-chlordane, aroclor-1254, endosulfan II, endrin, endrin aldehyde, endrin ketone, gamma-BHC, gamma-chlordane, heptachlor, and methoxychlor.

4.3.2.4 Polybrominated Biphenyls

Analysis of eight subsurface soil samples indicated the presence of detectable levels of PBBs in one sample. The concentration detected in this sample cannot be compared to any standards since there are no federal or state ARARs/TBCs for this class of compound. A limited number of subsurface soil samples were analyzed for PBBs; these samples were primarily collected in the center of the Site. Subsurface PBB contamination was detected in SB-29-01 (9.2 ng/g), which was collected at a depth of 3.5 feet from a location north of the concrete tank pad connected to Building No. 35. A map showing the location of SB-29 is presented in Plate 6.

4.3.2.5 Inorganics

Analysis of 63 subsurface soil samples indicated the presence of all TAL metals and cyanide; however, only three metals (arsenic, beryllium, and thallium) were detected at concentrations that exceeded both the TBCs and the average background concentrations. Metal contamination in the samples was not limited to any one portion of the property, but was found throughout the Site. A map showing the locations of subsurface soil samples containing inorganics above the TBCs, as well as the contaminants and concentrations detected in these samples, is presented in Plate 10. A summary of the inorganics detected in subsurface soil is presented in Table 4-10.

Arsenic was found in 47 samples at a concentration that exceeded the USEPA SSL (0.4 mg/kg) and in 18 samples at a concentration that exceeded the Site-specific background concentration (2.1 mg/kg). The concentration of arsenic did not exceed the NJDEP SSC (20 mg/kg) in any sample. The arsenic concentrations detected ranged from 0.46 J mg/kg to 7.4 mg/kg. Beryllium was detected in all of the subsurface soil samples at concentrations that exceeded the USEPA SSL (0.1 mg/kg), in 35 samples at concentrations that exceeded the Site-specific background (0.44 mg/kg), but did not exceed the NJDEP SSC (100 mg/kg) in a single sample. Beryllium was found at concentrations ranging from 0.22 J mg/kg to 0.93 J mg/kg. Arsenic and beryllium contamination was found at a maximum depth of 12 feet. Thallium was detected in 12 samples at concentrations ranging from 0.68 J mg/kg to 3.6 mg/kg and exceeded both the USEPA SSL (0.7 mg/kg) and the Site-specific background concentration (0.94 mg/kg) in three samples. One sample also had a concentration that exceeded the NJDEP SCC (2 mg/kg). Thallium was found at a maximum depth of 14 feet.

4.3.2.6 TCLP Parameters

Analysis of four on-site subsurface soil samples for TCLP parameters (VOCs, SVOCs, pesticides, herbicides, and metals) indicated the presence of VOCs, pesticides, and metals. All of the compounds/analytes were detected at trace levels (i.e., well below the RCRA regulatory limits). Based on the results, none of these subsurface soil samples would be characterized as a RCRA hazardous waste. TCLP compounds/analytes that were detected in the subsurface soils at concentrations below the ARARs include a VOC (benzene), a pesticide (gamma-BHC), and metals (barium, and lead).

4.3.3 Sump Sediment

4.3.3.1 Volatile Organic Compounds

Analysis of two sump sediment samples (SD-01 and SD-04) indicated the presence of 12 VOCs, all of which were detected in SD-04 at concentrations that exceeded the TBCs[8]. The VOCs detected include chlorinated compounds (methylene chloride, 1,2-dichloroethane, 1,2-dichloropropane, trichloroethene, 1,1,2-trichloroethane, tetrachloroethene, 1,1,2,2-tetrachloroethane, cis and trans-1,2-dichloroethene) and hydrocarbons (ethylbenzene, o-xylene, and m,p-xylene). No VOCs were detected in SD-01 at a concentration that exceeded the TBCs. A map showing the location of this sump sediment sample is presented in Plate 3. A tabular summary of the VOCs detected sediment is presented in Table 4-7.

Methylene chloride was detected at a concentration of 25,230,000 µg/kg; the USEPA SSL is 20 µg/kg and the NJDEP SCC is 1,000 µg/kg. Trans-1,2-dichloroethene was detected at a concentration of 21,000 J µg/kg; the USEPA SSL is 700 µg/kg. Cis-1,2-dichloroethene was detected at a concentration of 48,000 J µg/kg; the USEPA SSL is 400 µg/kg and the NJDEP SCC is 1,000 µg/kg. 1,2-Dichloroethane was detected at a concentration of 27,460,000 µg/kg; the USEPA SSL is 20 µg/kg and the NJDEP SCC is 1,000 µg/kg. 1,2-Dichloropropane was detected at a concentration of 16,000 J µg/kg; the USEPA SSL is 30 µg/kg. Trichloroethene was detected at a concentration of 230,000 µg/kg; the USEPA SSL is 60 µg/kg and the NJDEP SCC is 1,000 µg/kg. 1,1,2-Trichloroethane was detected at a concentration of 560,000 µg/kg; the USEPA SSL is 20 µg/kg and the NJDEP SCC is 1,000 µg/kg. Tetrachloroethene was detected at a concentration of 43,000 J µg/kg; the USEPA SSL is 60 µg/kg and the NJDEP SCC is 1,000 µg/kg. 1,1,2,2-Trichloroethane was detected at a concentration of 560,000 µg/kg; the USEPA SSL is 3 µg/kg and the NJDEP SCC is 1,000 µg/kg.

Ethylbenzene was detected at a concentration of 200,000 µg/kg; the USEPA SSL is 13,000 µg/kg and the NJDEP SCC is 100,000 µg/kg. m,p-Xylene was detected at a concentration of 3,800,000 µg/kg; the USEPA SSL is 200,000 µg/kg and the NJDEP SCC is 67,000 µg/kg. o-Xylene was detected at a concentration of 400,000 µg/kg; the USEPA SSL is 190,000 µg/kg and the NJDEP SCC is 67,000 µg/kg. In addition, the sum of all the TICs in this sample (2,276,000 EN µg/kg) exceeded the NJDEP SCC (1,000,000 µg/kg). Additional VOCs that were detected in the sump sediment samples at concentrations below the TBCs include styrene, tetrachloroethene, and toluene.

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[8]Both the USEPA SSL and NJDEP SCC criteria are applicable to soil samples, not sediment samples. However, these sediment samples were collected from a floor drain and sump, both of which may be accessible for direct contact. Therefore, as a conservative measure, the USEPA and NJDEP TBCs were applied to the sump sediment samples.

4.3.3.2 Semi-Volatile Organic Compounds

Analysis of two sump sediment samples (SD-01 and SD-04) indicated the presence of 23 SVOCs; however, only six were detected at concentrations that exceeded the TBCs. These include aromatic compounds (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, and carbazole) and a chlorinated hydrocarbon (hexachloroethane). A map showing the locations of SVOCs in the sump sediment samples above the TBCs is presented in Plate 4. A tabular summary of SVOCs in sediment is presented in Table 4-8.

Benzo(a)anthracene was detected in SD-04 at a concentration (3,000 J µg/kg) that exceeded the USEPA SSL (900 µg/kg). Benzo(b)fluoranthene was detected in both SD-01 and SD-04 at concentrations (1,400 E µg/kg and 2,800 J µg/kg, respectively) that exceeded the USEPA SSL (900 µg/kg). Benzo(a)pyrene was detected in both SD-01 and SD-04 at concentrations (860 E µg/kg and 2,900 J µg/kg, respectively) that exceeded both the USEPA SSL (90 µg/kg) and the NJDEP SCC (660 µg/kg). Dibenz(a,h,)anthracene was detected in SD-01 at a concentration (220 J µg/kg) that exceeded the USEPA SSL (90 µg/kg). Carbazole was detected in SD-04 at a concentration (1,300 J µg/kg) that exceeded the USEPA SSL (600 µg/kg). Hexachloroethane was detected in SD-04 at a concentration (4,700 E µg/kg) that exceeded that USEPA SSL (500 µg/kg).

Additional SVOCs that were detected in the sump sediment samples at concentrations below the TBCs include phenol, naphthalene, acenaphthene, fluorene, 4-bromophenyl-phenyl ether, hexachlorobenzene, phenanthrene, anthracene, di-n-butylphthalate, fluoranthene, pyrene, chrysene, bis(2-ethylhexyl)phthalate, di-n-octylphthalate, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene.

4.3.3.3 Pesticides/PCBs

Analysis of two sump sediment samples (SD-01 and SD-04) indicated the presence of 15 pesticides; however, only eight were detected at concentrations that exceeded the TBCs. These include alpha-BHC, gamma-BHC, heptachlor, aldrin, dieldrin, 4,4'-DDD, alpha-chlordane, and gamma-chlordane, which are all chlorinated compounds. A map showing the locations of pesticides in the sump sediment samples above the TBCs is presented in Plate 5. A tabular summary of the pesticide/PCBs detected in sediment is presented in Table 4-9.

Alpha-BHC (2,800 EN µg/kg) and gamma-chlordane (760 EN µg/kg) were both detected in SD-04 at concentrations that exceeded the USEPA SSLs (100 µg/kg and 500 µg/kg, respectively). There are no NJDEP SCC values for these compounds. Gamma-BHC was detected in SD-04 at a concentration (9,300 µg/kg) that exceeded both the USEPA SSL (500 µg/kg) and the NJDEP SCC (2,200 µg/kg). Heptachlor was detected in SD-04 at a concentration (840 E µg/kg) that exceeded both the USEPA SSL (100 µg/kg) and the NJDEP SCC (650 µg/kg). Aldrin was detected in SD-04 at a concentration (2,600 E µg/kg) that exceeded both the USEPA SSL (40 µg/kg) and the NJDEP SCC (170 µg/kg). Dieldrin was detected in both SD-01 and SD-04 at concentrations (190 E and 24,000 E, respectively) that exceeded both the USEPA SSL (40 µg/kg) and the NJDEP SCC (180 µg/kg). 4,4'-DDD was detected in SD-04 at a concentration (52,000 µg/kg) that exceeded both the USEPA SSL (3,000 µg/kg) and the NJDEP SCC (12,000 µg/kg). Alpha-Chlordane was detected in both SD-01 and SD-04 at concentrations (670 µg/kg and 20,000 EN µg/kg, respectively) that exceeded the USEPA SSL (500 µg/kg). There is no NJDEP SCC value for this compound.

Additional pesticides that were detected in the sump sediment samples at concentrations below the TBCs include delta-BHC, 4,4'-DDE, endrin, endosulfan sulfate, methoxychlor, endrin ketone, and endrin aldehyde.

4.3.3.4 Polybrominated Biphenyls

Analysis of the two sump sediment samples indicated the presence of detectable levels of PBBs (76 E ng/g in SD-01 and 750 ng/g in SD-04) in both samples. The concentrations detected in these samples cannot be compared to any standards since there are no federal or state ARARs/TBCs for this class of compound. A map showing the location of PBBs in sump sediment is presented in Plate 6.

4.3.3.5 Inorganics

Analysis of two sump sediment samples (SD-01 and SD-04) indicated the presence of all of the TAL contaminants except silver, selenium, thallium, and cyanide. However, only five metals were detected at concentrations that exceeded the TBCs. These include antimony, arsenic, beryllium, chromium, and mercury. A map showing the locations of inorganics in the sump sediments above the TBCs is presented in Plate 7. A tabular summary of the inorganics in sediment is presented in Table 4-10.

Antimony was detected in SD-01 at a concentration (167 mg/kg) that exceeded the USEPA SSL (31 mg/kg) and in SD-04 at a concentration (1,720 mg/kg) that exceeded both the USEPA SSL and the NJDEP SCC (340 mg/kg). Arsenic was detected in both SD-01 and SD-04 at concentrations (12 mg/kg and 8.8 mg/kg, respectively) that exceeded the USEPA SSL (0.4 mg/kg). Beryllium was detected in SD-01 at a concentration (0.41 J mg/kg) that exceeded the USEPA SSL (0.1 mg/kg). Chromium was detected in both SD-01 (123 mg/kg) and SD-04 (150 mg/kg) at concentrations that exceeded the USEPA SSL (38 mg/kg). Mercury was detected in both SD-01 (5.5 mg/kg) and SD-04 (4.1 mg/kg) at concentrations that exceeded the USEPA SSL (2 mg/kg).

4.3.3.6 TCLP Parameters

Analysis of the two sump sediment samples (SD-01 and SD-04) for TCLP parameters (VOCs, SVOCs, pesticides, herbicides, and metals) indicated the presence of VOCs, pesticides, and metals. The majority of the compounds/analytes were detected at trace levels (i.e., well below the RCRA regulatory limits); however, one VOC (1,2-dichloroethane) was detected at a concentration that exceeded the ARAR. 1,2-Dichloroethane was detected in both SD-01 and SD-04 at concentrations (790 E µg/l and 760,000 µg/l, respectively) that exceeded the RCRA regulatory limit (500 µg/l). Additional TCLP compounds/analytes that were detected in the sump sediment samples at concentrations below the ARARs include VOCs (vinyl chloride, chloroform, trichloroethene, benzene, and tetrachloroethene), a pesticide (gamma-BHC), and a metal (barium). A map showing the locations of the TCLP parameters in sump sediments is presented in Plate 6.

4.3.4 Groundwater

4.3.4.1 Volatile Organic Compounds

First Round

Analysis of groundwater samples from the seven shallow monitoring wells indicated the

presence of nine VOCs; six of these were detected at concentrations that exceeded the ARARs. These compounds, which are all chlorinated, include 1,2-dichloroethene (total), 1,2-dichloroethane, trichloroethene, 1,1,2-trichloroethane, tetrachloroethene, and 1,1,2,2-tetrachloroethene. None of these VOCs were detected in the background ECRA monitoring wells. A map showing the locations of groundwater samples containing specific VOCs above the ARARs is presented in Plate 11. A tabular summary of the VOCs detected in groundwater during the first round of sampling is presented in Table 4-7.

1,2-dichloroethene (total) was detected in five samples at concentrations ranging from 3 J µg/L to 450 µg/L and exceeded the NJDEP GQC (10 µg/L) in three samples. One of these samples also exceeded the USEPA MCL (70 µg/L[9]). 1,2-Dichloroethane was detected in five samples at concentrations ranging from 120 µg/L to 4,400 µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (2 µg/L). Trichloroethene was detected in seven samples at concentrations ranging from 5 J µg/L to 1,700 µg/L, all of which exceeded or equaled the USEPA MCL (5 µg/L) and the NJDEP GQC (1 µg/L). 1,1,2-Trichloroethane was detected in six samples at concentrations ranging from 23 µg/L to 290 µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (3 µg/L). Tetrachloroethene was detected in four samples at concentrations ranging from 3 J µg/L to 24 J µg/L, all of which exceeded the NJDEP GQC (1 µg/L) and three samples also exceeded the USEPA MCL (5 µg/L). 1,1,2,2-Tetrachloroethene was detected in six samples at concentrations ranging from 14 µg/L to 1,500 µg/L, all of which exceeded the NJDEP GQC (2 µg/L) (there is no USEPA MCL). Additional VOCs that were detected in the shallow wells at concentrations below the ARARs include 1,1-dichloroethene, chloroform, and toluene.

Analysis of groundwater samples from the four deep monitoring wells indicated the presence of nine VOCs; seven of these were detected at concentrations that exceeded the ARARs. These compounds, which are all chlorinated, include 1,1-dichloroethene, 1,2-dichloroethene (total), 1,2-dichloroethane, trichloroethene, 1,1,2-trichloroethane, tetrachloroethene, and 1,1,2,2-tetrachloroethene. None of these VOCs were detected in the background ECRA monitoring wells.

1,1-Dichloroethene was detected in one sample at a concentration of 16 J µg/L, which exceeded the USEPA MCL (7 µg/L) and the NJDEP GQC (2 µg/L). 1,2-Dichloroethene (total) was detected in two samples at concentrations ranging from 100 J µg/L to 130 µg/L, all of which exceeded the USEPA MCL (70 µg/L) and the NJDEP GQC (10 µg/L). 1,2-Dichloroethane was detected in four samples at concentrations ranging from 730 µg/L to 250,000 µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (2 µg/L). Trichloroethene was detected in four samples at concentrations ranging from 150 J µg/L to 1,500 J µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (1 µg/L). 1,1,2-Trichloroethane was detected in three samples at concentrations ranging from 160 µg/L to 2,100 J µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (3 µg/L). Tetrachloroethene was detected in two samples at concentrations ranging from 40 J µg/L to 670 J µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (1 µg/L). 1,1,2,2-Tetrachloroethene was detected in three samples at concentrations ranging from 22 J µg/L to 2,800 J µg/L, all of

[9]An MCL is given for cis and trans-1,2-dichloroethene, not total dichloroethene. This value is the lower of the two.

which exceeded the NJDEP GQC (2 µg/L) (there is no USEPA MCL). Additional VOCs that were detected in the deep wells at concentrations below the ARARs include 1,1-dichloroethane and toluene.

Second Round

Analysis of groundwater samples from the seven shallow monitoring wells indicated the presence of ten VOCs. Eight VOCs, which are all chlorinated, were detected at concentrations that exceeded the ARARs including vinyl chloride, 1,1-dichloroethene, 1,2-dichloroethene (total), 1,2-dichloroethane, trichloroethene, 1,1,2-trichloroethane, tetrachloroethene, 1,1,2,2-tetrachloroethene. None of these VOCs were detected in the background ECRA monitoring wells. A map showing the locations and concentrations of VOCs in groundwater above the ARARs is presented in Plate 12. A tabular summary of the VOCs detected in groundwater during the second round of sampling is presented in Table 4-7.

Vinyl chloride was detected in one sample at a concentration of 4 J µg/L, which is above the USEPA MCL of 2 µg/L. 1,1-Dichloroethene was detected in two samples at concentrations ranging from 5 J µg/L to 6 J µg/L, which are above the NJDEP GQC of 2 µg/L. 1,2-Dichloroethene (total) was detected in six samples at concentrations ranging from 6 J µg/L to 660 µg/L; the NJDEP GQC (10 µg/L) was exceeded in five samples and the USEPA MCL (70 µg/L) was exceeded in three samples. 1,2-Dichloroethane was detected in seven samples at concentrations ranging from 70 µg/L to 3,200 µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (2 µg/L). Trichloroethene was detected in seven samples at concentrations ranging from 19 J µg/L to 2,400 µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (1 µg/L). 1,1,2-Trichloroethane was detected in seven samples at concentrations ranging from 18 J µg/L to 450 µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (3 µg/L). Tetrachloroethene was detected in three samples at concentrations ranging from 6 J µg/L to 35 J µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (1 µg/L). 1,1,2,2-Tetrachloroethene was detected in five samples at concentrations ranging from 71 µg/L to 1,400 µg/L, all of which exceeded the NJDEP GQC (2 µg/L), however, there is no USEPA MCL for 1,1,2,2-tetrachloroethene. Additional VOCs that were detected in the shallow wells at concentrations below the ARARs include chloroform and xylenes (total).

Analysis of groundwater samples from the four deep monitoring wells indicated the presence of 11 VOCs. Eight of the VOCs, which are all chlorinated, were detected at concentrations that exceeded the ARARs including methylene chloride, 1,1-dichloroethene, 1,2-dichloroethene (total), 1,2-dichloroethane, trichloroethene, 1,1,2-trichloroethane, tetrachloroethene, and 1,1,2,2-tetrachloroethene. Only methylene chloride was detected in the background ECRA monitoring wells.

Methylene chloride was detected in one sample at a concentration of 100 J µg/L, which exceeded the USEPA MCL (5 µg/L), the NJDEP GQC (2 µg/L) and the background concentration. 1,1-Dichloroethene was detected in two samples at concentrations ranging from 19 J µg/L to 100 J µg/L, which exceeded the USEPA MCL (7 µg/L) and the NJDEP GQC (2 µg/L). 1,2-Dichloroethene (total) was detected in two samples at concentrations ranging from 140 µg/L to 170 J µg/L, which exceeded the USEPA MCL (70 µg/L) and the NJDEP GQC (10 µg/L). 1,2-Dichloroethane was detected in four samples at concentrations ranging from 960 µg/L to 260,000 µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC

(2 µg/L). Trichloroethene was detected in four samples at concentrations ranging from 190 J µg/L to 1,500 J µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (1 µg/L). 1,1,2-Trichloroethane was detected in four samples at concentrations ranging from 96 J µg/L to 2,200 J µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (3 µg/L). Tetrachloroethene was detected in two samples at concentrations ranging from 46 J µg/L to 510 J µg/L, all of which exceeded the USEPA MCL (5 µg/L) and the NJDEP GQC (1 µg/L). 1,1,2,2-Tetrachloroethene was detected in one sample at a concentration of 57 J µg/L, which exceeded the NJDEP GQC (2 µg/L), however, there is no USEPA MCL for 1,1,2,2-Tetrachloroethene. Additional VOCs that were detected in the deep wells at concentrations below the ARARs include 1,1-dichloroethane, chloroform, and 1,1,1-trichloroethane.

4.3.4.2 Semi-Volatile Organic Compounds

First Round

Analysis of groundwater samples from all 11 monitoring wells indicated the presence of 17 SVOCs; however, none were detected at concentrations that exceeded the ARARs. The compounds that were detected include phenol, 2,2'-oxybis(1-Chloropropane), 2,4-dimethylphenol, naphthalene, 2-chloronaphthalene, dimethylphthalate, acenaphthene, dibenzofuran, fluorene, phenanthrene, anthracene, carbazole, fluoranthene, pyrene, butylbenzylphthalate, benzo(a)anthracene, and chysene. A summary of the SVOCs detected in groundwater during the first round of sampling is presented in Table 4-8.

Second Round

Analysis of groundwater samples from all 11 monitoring wells indicated the presence of 11 SVOCs; however, none were detected at concentrations that exceeded the ARARs. The compounds that were detected include phenol, 2,2'-oxybis(1-Chloropropane), 2,4-dimethylphenol, naphthalene, dibenzofuran, diethylphthalate, phenanthrene, anthracene, carbazole, fluoranthene, and pyrene. A summary of the SVOCs detected in groundwater during the second round of sampling is presented in Table 4-8.

4.3.4.3 Pesticides/PCBs

First Round

Analysis of groundwater samples from all 11 monitoring wells indicated the presence of four pesticides; however, none were detected at concentrations that exceeded the ARARs. The compounds that were detected include heptachlor epoxide, 4,4'-DDE, endosulfan II, and endrin aldehyde. A summary of the pesticide/PCB compounds in the first round of groundwater sampling is presented in Table 4-9.

Second Round

Analysis of groundwater samples from all 11 monitoring wells indicated the presence of six pesticides/PCBs; however, none were detected at concentrations that exceeded the ARARs. The compounds that were detected include aldrin, dieldrin, 4,4'-DDD, alpha-chlordane, gamma-chlordane, and aroclor-1260. A summary of the pesticide/PCB compounds detected in the second round of groundwater sampling is presented in Table 4-9.

4.3.4.4 Polybrominated Biphenyls

First Round

Analysis of groundwater samples from all 11 monitoring wells did not indicate the presence of detectable levels of PBBs.

Second Round

Analysis of groundwater samples from the seven shallow monitoring wells indicated the presence of PBBs in three samples. The concentrations detected ranged from 7.9 E nanograms per liter (ng/L) to 11 ng/L. Analysis of groundwater samples from the four deep monitoring wells indicated the presence of PBBs in one sample at a concentration of 25 ng/L. None of the detected concentrations can be compared to any standards since there are no federal or state ARARs/TBCs for this class of compound[10]. A map showing the locations of PBBs in groundwater is presented in Plate 12.

4.3.4.5 Inorganics

First Round

Analysis of groundwater samples from all 11 monitoring wells indicated the presence of 18 metals and cyanide. Four metals (aluminum, iron, manganese, and sodium) were detected at concentrations that exceeded the NJDEP GQC (none has a USEPA MCL), however, none of these constituents were detected in the soil at concentrations that exceeded the TBCs and/or the Site-specific background concentrations. A summary of the inorganic constituents above the ARARS detected in groundwater during the first round of sampling is presented in Table 4-10.

Second Round

Analysis of groundwater samples from the 11 monitoring wells (seven shallow and four deep wells) indicated the presence of 21 metals; however, only eight metals (aluminum, antimony, cadmium, iron, lead, manganese, sodium, and thallium) were detected at concentrations that exceeded the ARARs. Four of these metals (aluminum, iron, manganese, and sodium) were not detected in the soil at concentrations that exceeded the TBCs and/or the Site-specific background concentration. The remaining four metals (i.e., antimony, cadmium, lead, and thallium) were all detected in the on-site soil at concentrations that exceeded the TBCs and the Site-specific background concentrations. Background groundwater concentrations are not available for the inorganics since the ECRA wells were only analyzed for VOCs. A map showing the locations of inorganic constituents above the ARARs detected in the groundwater during the second round of sampling is presented in Plate 12. A tabular summary of the inorganics detected during the second round of sampling is presented in Table 4-10.

Antimony (total[11]) was detected in three shallow wells at concentrations ranging from 5.1 J µg/L to 6 J µg/L and in two deep wells at concentrations ranging from 5.7 J µg/L to 11.4 J µg/L. One sample collected from a deep well exceeded the USEPA MCL (6 µg/L) but not the

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[10]There are no USEPA Region 2 ARARs/TBCs for PBBs; however, Region 9 has a PRG of 0.0076 µg/L for tap water.

[11]Both filtered and non-filtered TAL groundwater samples were collected during the RI. For this discussion, total will indicate a non-filtered sample while dissolved will indicate a filtered sample.

NJDEP GQC (20 µg/L). Antimony (dissolved) was detected in one deep well at 6.1 J µg/L, which slightly exceeded the USEPA MCL (6 µg/L). Cadmium (total) was detected in two shallow wells at concentrations ranging from 4.3 J µg/L to 6.6 µg/L and in two deep wells at concentrations ranging from 3.7 J µg/L to 24.9 µg/L. Three samples (two shallow and one deep) exceeded the NJDEP GQC (4 µg/L); two of these also exceeded the USEPA MCL (5 µg/L). Lead (total) was detected in all seven shallow wells at concentrations ranging from 3.1 µg/L to 94.5 µg/L and in all four deep wells at concentrations ranging from 5.6 µg/L to 790 µg/L. Five samples (three shallow and two deep) exceeded the USEPA MCL (15 µg/L) and the NJDEP GQC (10 µg/L). Thallium (dissolved) was detected in one shallow well at 7.6 J µg/L, which exceeded the USEPA MCL (2 µg/L) but not the NJDEP GQC (10 µg/L). Thallium (total) was not detected in any of the unfiltered samples and therefore, may be suspect.

4.3.4.6 Water Quality Parameters

The groundwater samples were analyzed for six water quality parameters[12] including TOC, TDS, alkalinity (expressed as mg/L of calcium carbonate), sulfate, chloride, and nitrate. There are no ARARs/TBCs for TOC or alkalinity.

First Round

The measured concentrations of TOC ranged from 1.9 mg/L to 13 mg/L in the shallow wells and from 1.1 mg/L to 6.7 E mg/L in the deep wells. Alkalinity ranged from 21.3 mg/L to 299 mg/L in the shallow wells and 121 mg/L to 239 mg/L in the deep wells. TDS ranged from 155 mg/L to 649 mg/L in the shallow wells and 400 mg/L to 2,510 mg/L in the deep wells. One shallow well and three deep wells had TDS concentrations that exceeded the USEPA MCL[13] (500 mg/L) and the NJDEP GQC (500 mg/L). Sulfate ranged from 25 mg/L to 250 mg/L in the shallow wells and 22 mg/L to 87 mg/L in the deep wells. None of these concentrations exceeded the USEPA MCL (500 mg/L) or the NJDEP GQC (250 mg/L). Chloride ranged from 12 E mg/L to 150 E mg/L in the shallow wells and 38 E mg/L to 620 E mg/L in the deep wells. Three deep wells had concentrations that exceeded the USEPA MCL (250 mg/L) and the NJDEP GQC (250 mg/L). Nitrate ranged from non-detect to 6.7 E mg/L in the shallow wells and non-detect to 2.9 E mg/L in the deep wells. None of these concentrations exceeded the USEPA MCL (10 mg/L) or the NJDEP GQC (10 mg/L).

Second Round

The measured concentrations of TOC ranged from 2.2 mg/L to 11 E mg/L in the shallow wells and from 1.1 mg/L to 7.3 E mg/L in the deep wells. Alkalinity ranged from non-detect to 148 mg/L in the shallow wells and 122 mg/L to 221 mg/L in the deep wells. TDS ranged from 142 mg/L to 490 E mg/L in the shallow wells and 392 mg/L to 2,570 E mg/L in the deep wells. Three deep wells had TDS concentrations that exceeded the USEPA MCL (500 mg/L) and the NJDEP GQC (500 mg/L). Sulfate ranged from 42 mg/L to 6,200 mg/L in the shallow wells and 17 mg/L to 86 mg/L in the deep wells. One shallow well had a concentration that exceeded the

[12]Water quality parameters are used to indicate the quality of the water. As described in Section 5.4.4, some of these parameters can be used to predict the fate and transformation of contaminants in groundwater.

[13]The USEPA MCLs for TDS, sulfate, chloride, and nitrate are unenforceable federal guidelines.

USEPA MCL (500 mg/L) and the NJDEP GQC (250 mg/L). Chloride ranged from 2.3 E mg/L to 120 E mg/L in the shallow wells and 41 E mg/L to 1,000 E mg/L in the deep wells. Three deep wells had concentrations that exceeded the USEPA MCL (250 mg/L) and the NJDEP GQC (250 mg/L). Nitrate ranged from non-detect to 5 mg/L in the shallow wells and non-detect to 3.4 mg/L in the deep wells. None of these concentrations exceeded the USEPA MCL (10 mg/L) or the NJDEP GQC (10 mg/L).

4.3.5 Building Materials - Asbestos

Analysis of 74 building material samples identified 36 of the samples with ACM[14] (30 samples contained friable asbestos; six samples contained non-friable, organically bound asbestos). The percentage of asbestos ranged from 1.3% to 66.7%.

The asbestos samples were collected from seven buildings (Building Nos. 33, 34, and 35, the Boiler Room, Decon Shed, Maintenance Shop, and Pump House) and one exterior location (Yard south of Building No. 35). ACM was detected in all of the Site buildings except the Decon Shed and the Pump House. The number of samples from each building that contained ACM are detailed below.

- Building No. 33 - 9 samples (friable and non-friable)
- Building No. 34 - 10 samples (friable and non-friable)
- Building No. 35 - 10 samples (friable and non-friable)
- Boiler Room - 6 samples (friable only)
- Maintenance Shop - 1 sample (friable)

The majority of the ACM were insulation, flooring, and roofing. The remaining ACM were from laboratory related furnishings, caulking, and miscellaneous debris. Sample locations in each building are shown on Figures 4-2 through 4-8. A summary of the sampling results is presented in Table 4-11.

4.3.6 Building Materials - Lead Paint/Dust

4.3.6.1 XRF Results

A total of 967 XRF readings were collected from the buildings to screen for lead paint/dust (361 from Building No. 33; 138 from Building No. 34; 372 from Building No. 35; 33 from Building No. 36; 15 from the Maintenance Shop; 21 from the Boiler Room, and 27 from the Pump House). The XRF readings were taken from various combinations of substrates and building structural components (e.g., metal doors, steel columns and beams, concrete blocks, and metal railings). A minimum of three XRF readings were collected from each testing combination.

A total of 98 readings indicated the presence of lead-based paint at or above the advisory level of 1.0 mg/cm^2 (25 from Building No. 33; 9 from Building No. 34; 48 from Building No. 35; 3 from Building No. 36; 6 from the Boiler Room; and 7 from the Pump House). All positive sample results were taken from steel or other metal substrates, except for a wooden door casing.

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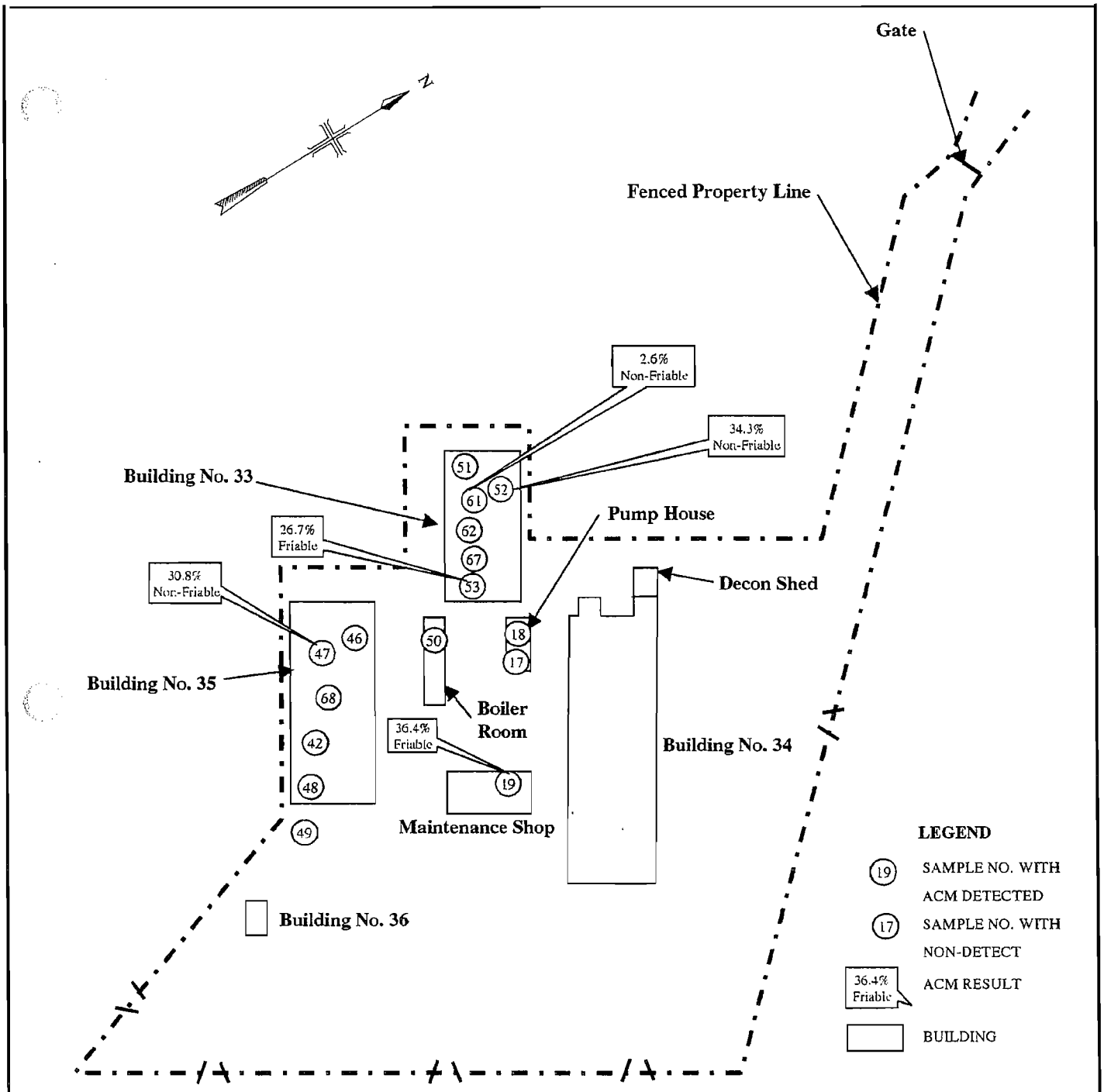
[14]ACM is identified as any material which contains more than 1% asbestos by weight, regardless of the asbestiform variety.



NOTE:
THE RELATIVE LOCATION FOR SAMPLE NOs. 61, 62, 67, AND 68 ON THE BUILDING ROOFS ARE UNKNOWN

NOT TO SCALE

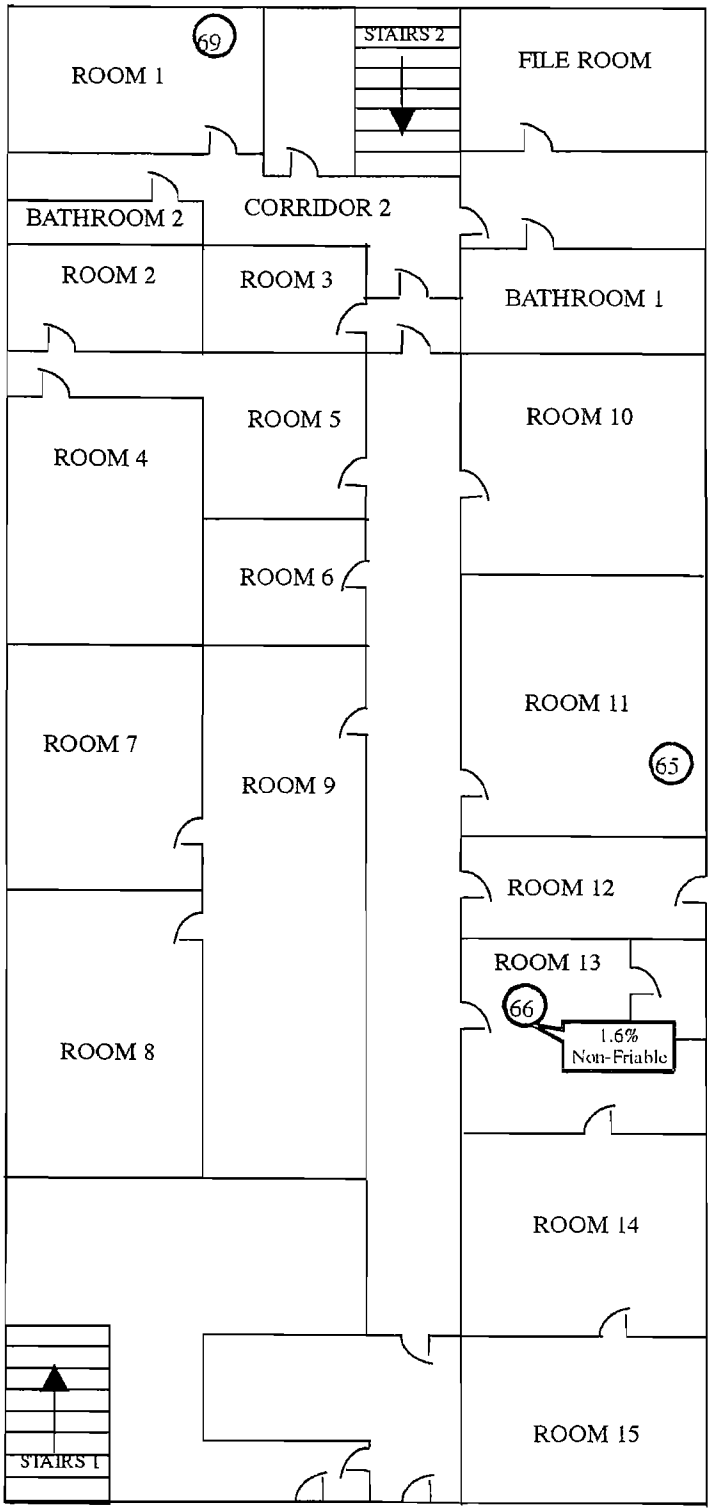
MALCOLM PIRNIE

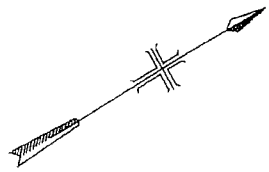
WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

SITE OVERVIEW
ASBESTOS SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

FIGURE 4-2





LEGEND

66 SAMPLE NO. WITH ACM DETECTED

65 SAMPLE NO. WITH NON-DETECT

36.4% Friable — ACM RESULT

LOCATION		
ROOM	AREA	SAMPLE ID
Room 1	57	69
Room 2	59	
Room 3		
Room 4	61	
Room 5	60	
Room 6		
Room 7	63	
Room 8		
Room 9		65
Room 10	54	
Room 11	53	66
Room 12	52	
Room 13	51	
Room 14	50	
Room 15	49	
Stairs 1	48	
Stairs 2	58	
File Room	56	
Bathroom 1	55	
Corridor 1	64	

NOT TO SCALE

MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BUILDING NO. 33, FIRST FLOOR
ASBESTOS SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

FIGURE 4-3

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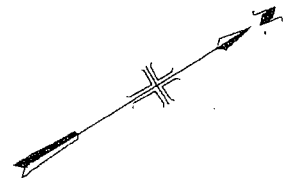
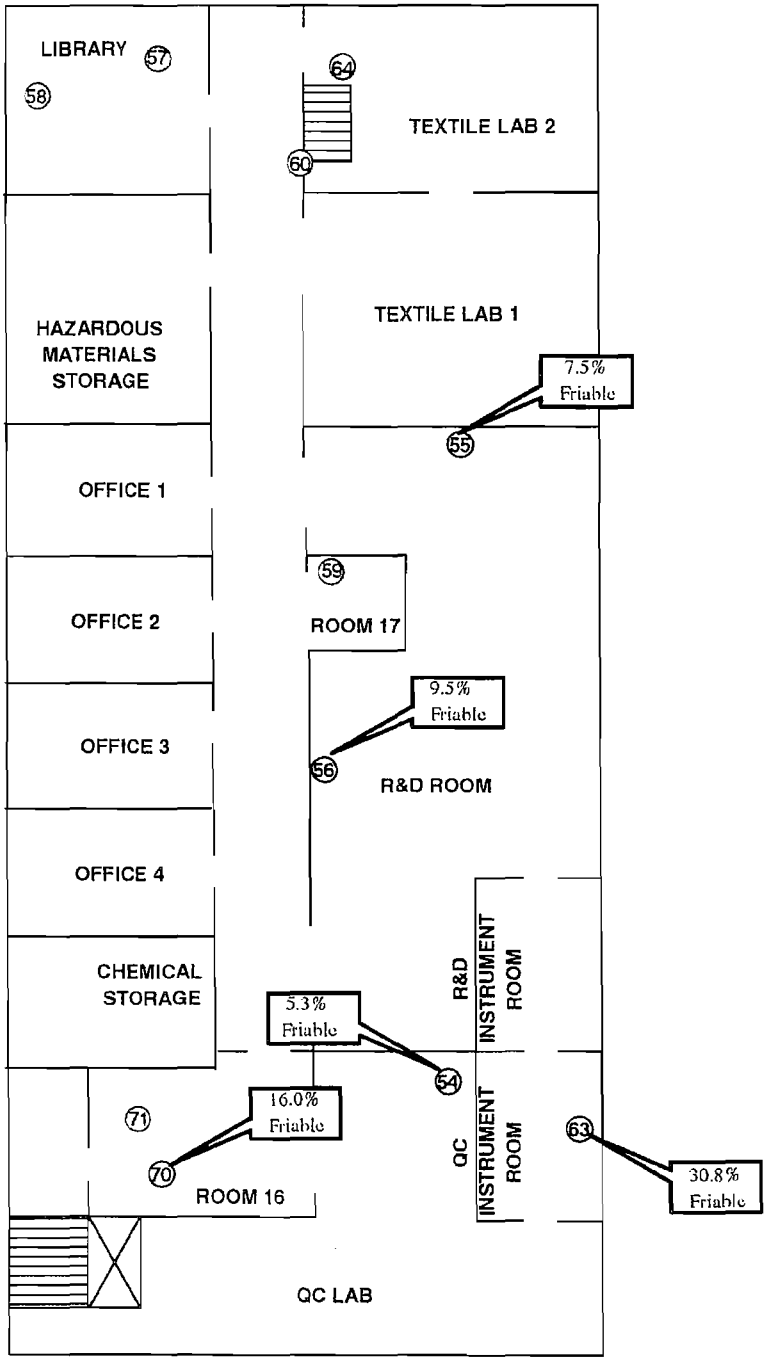


LEGEND

(19) SAMPLE NO. WITH ACM DETECTED

(17) SAMPLE NO. WITH NON-DETECT

36.4% Friable — ACM RESULT



LOCATION		
ROOM	AREA	SAMPLE ID
Library	32	57 58
Hazardous Materials Storage	34	
Office 1	39	
Office 2	40	
Office 3	42	
Office 4	43	
Chemical Storage	44	
Room 16	45	70 71
Room 17	44	59
Corridor 3	46	
Stairs 3	31	60,64
Textile Lab 1	33	
Textile Lab 2	47	
R&D Room	38	55 56
R&D Instrument	37	
QC Instrument	36	63
QC Lab	35	54

SOURCE: ROY F. WESTON, INC.
MAJOR PROGRAMS DIVISION

NOT TO SCALE

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P-302006

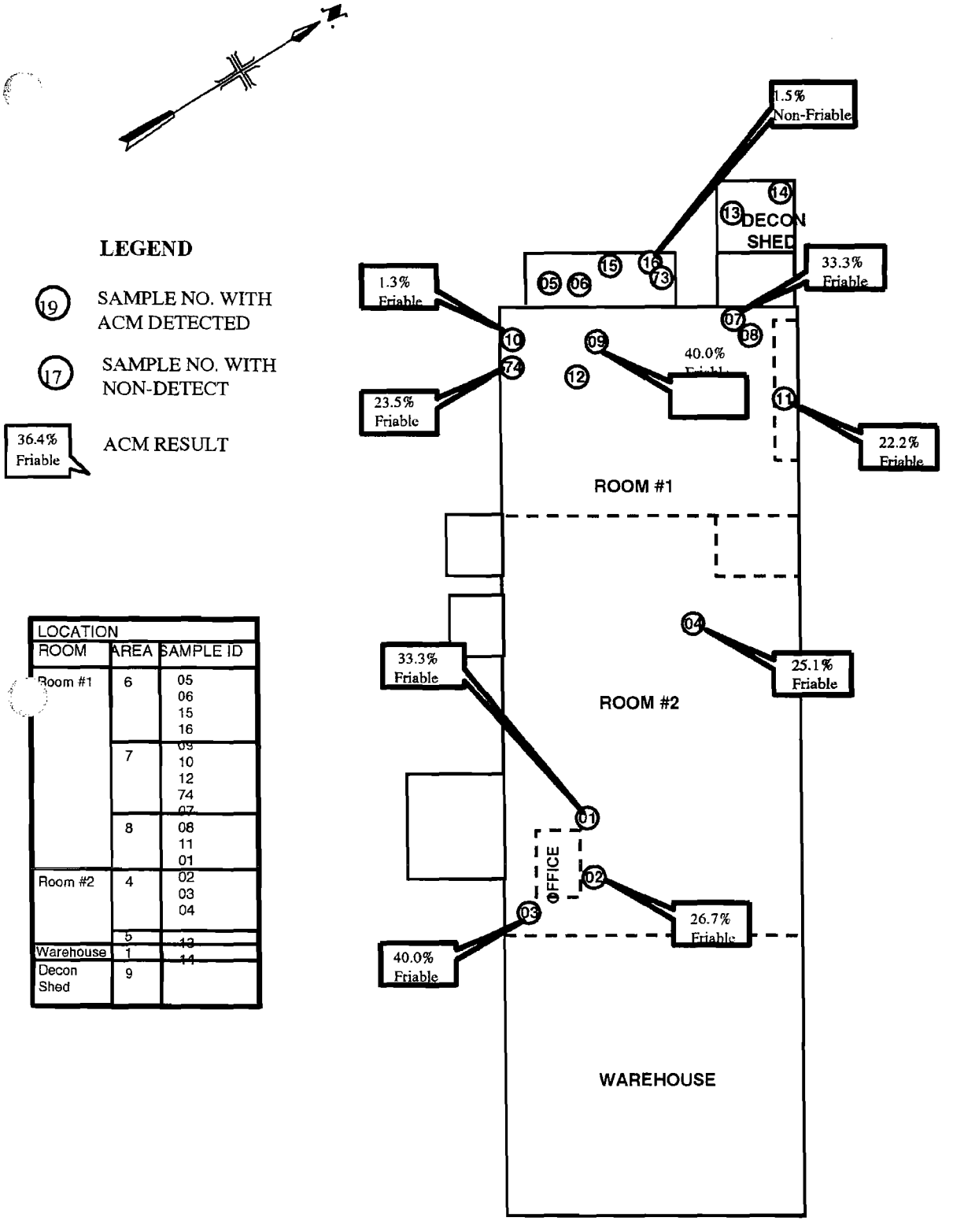
MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BUILDING NO. 33, SECOND FLOOR
ASBESTOS SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

FIGURE 4-4



LOCATION		
ROOM	AREA	SAMPLE ID
Room #1	6	05 06 15 16
	7	09 10 12 74 07
	8	08 11 01
Room #2	4	02 03 04
	5	13
Warehouse	1	14
Decon Shed	9	

SOURCE: ROY F. WESTON, INC.
MAJOR PROGRAMS DIVISION

NOT TO SCALE

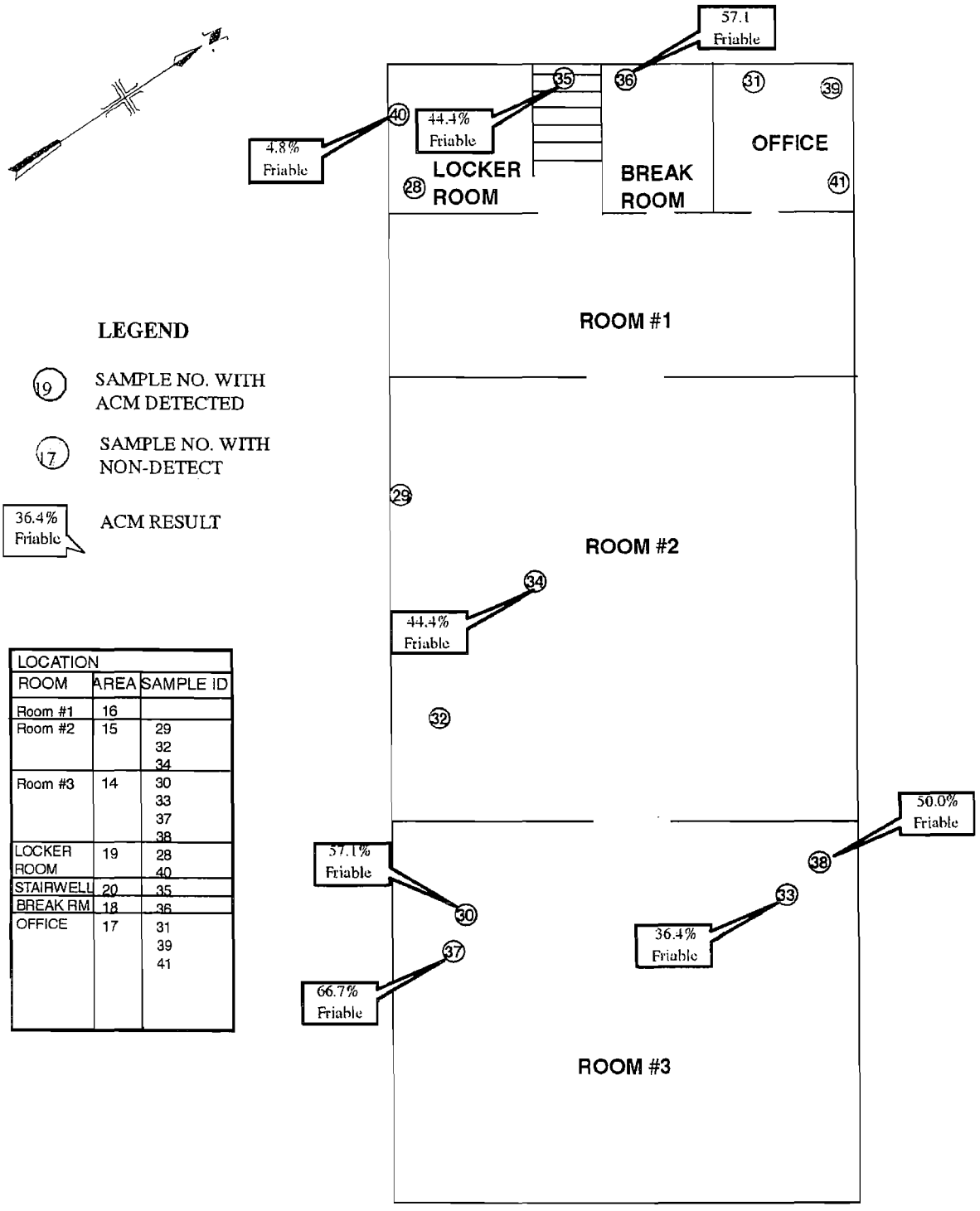
MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BUILDING NO. 34
ASBESTOS SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

FIGURE 4-5



LOCATION		
ROOM	AREA	SAMPLE ID
Room #1	16	
Room #2	15	29 32 34
Room #3	14	30 33 37 38
LOCKER ROOM	19	28 40
STAIRWELL	20	35
BREAK RM	18	36
OFFICE	17	31 39 41

SOURCE: ROY F. WESTON, INC.
MAJOR PROGRAMS DIVISION

NOT TO SCALE

MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BUILDING NO. 35, FIRST FLOOR
ASBESTOS SAMPLE LOCATINS

MALCOLM PIRNIE, INC.

FIGURE 4-6

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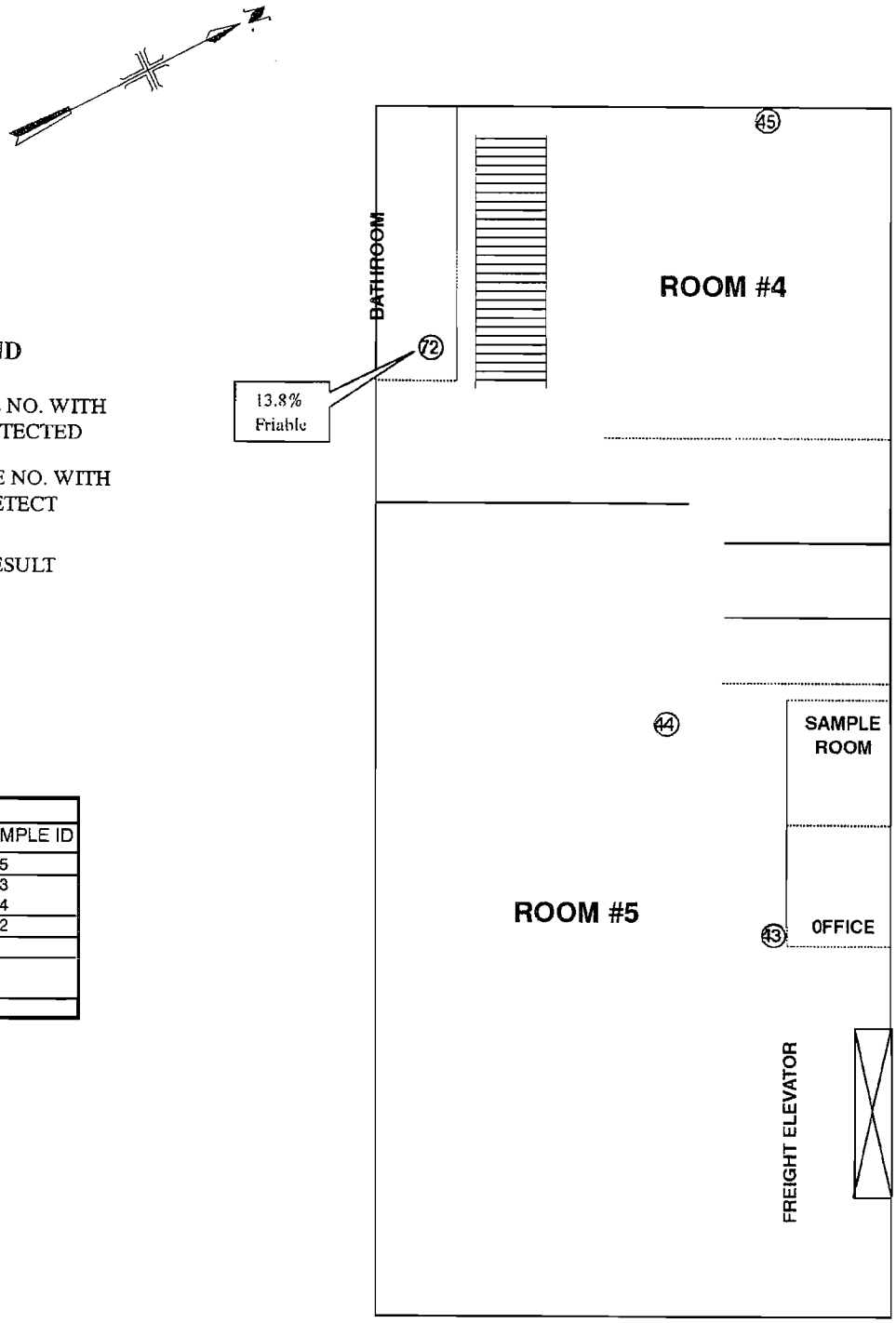


LOCATION		
ROOM	AREA	SAMPLE ID
Room #4	24	45
Room #5	21	43 44
Bathroom		72
Stairwell	25	
Sample Room	23	
Office	22	

SOURCE: ROY F. WESTON, INC.
MAJOR PROGRAMS DIVISION

NOT TO SCALE

BESTESZIP PRE

P-302000

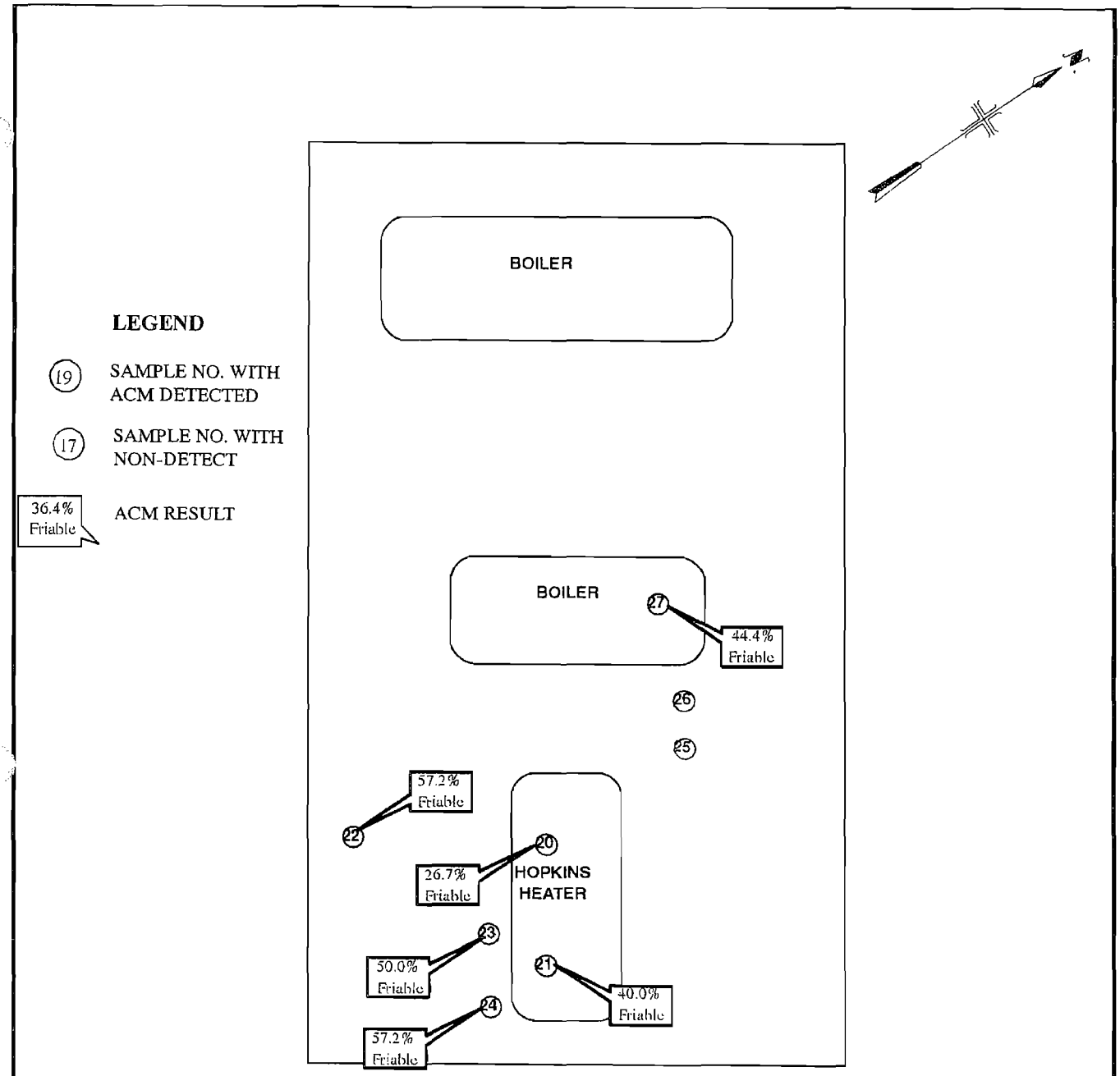
MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BUILDING NO. 35, SECOND FLOOR
ASBESTOS SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

FIGURE 4-7



NOT TO SCALE

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MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BOILER ROOM
ASBESTOS SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

FIGURE 4-8

TABLE 4-11
SUMMARY OF POSITIVE ASBESTOS SAMPLING RESULTS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Building	Description of material containing asbestos	% ACM	Friable or Non-Friable
Bldg. 33, 1st Floor	Gray 1' X 1' Floor Tiles and Mastics	1.6	N
Bldg. 33, 2nd Floor	3" Magenta Block Insulation	30.8	F
	3" White/Gray Pipe Fitting Insulation	16.0	F
	Gray Panels in Fume Hood	5.3	F
	Gray/White Counter Top	7.5	F
	Lab Counter	9.5	F
Bldg. 33, Roof	Black Roof Flashing	26.7	F
	Black/Brown Built-Up Roof Material	2.6	N
	Black Roof Flashing	34.3	N
Bldg. 34	4" Gray Pipe Insulation	26.7	F
	4" White Pipe Insulation	25.1	F
	4" White Pipe Insulation	33.3	F
	Beige 1' X 1' Floor Tile	33.3	F
	Debris	40.0	F
	Gray/Brown Miscellaneous Gaskets on Large Tank	22.2	F
	Gray Miscellaneous Gasket Debris	40.0	F
	Magenta Block Debris	23.5	F
	Black Window Caulking	1.5	N
	White/Gray Window Caulking	1.3	N
Bldg. 35, 1st Floor	4" Gray/White Pipe Fitting Insulation	66.7	F
	4" White/Green Pipe Insulation	57.1	F
	4" White Magenta Block Insulation	57.1	F
	6" Gray/White Pipe Insulation	36.4	F
	6" White Pipe Insulation	44.4	F
	6" White Pipe Fitting Insulation	50.0	F
	Black Caulking	4.8	F
	Debris	44.4	F
Bldg. 35, 2nd Floor	4" White Magenta Block Fitting	13.8	F
Bldg. 35, Roof	Built-Up Roofing Material	30.8	N
Boiler Room	4" White Pipe Fitting Insulation	50.0	F
	4" White/Gray Pipe Fitting Insulation	57.2	F
	Brown Gasket on 12" Boiler Flue	44.4	F
	White Block Breeching Debris	57.2	F
	White/Gray Block Boiler Breeching	26.7	F
	White/Gray Block Boiler Breeching	40.0	F
Maintenance Shop	Dark Gray Miscellaneous Gaskets	36.4	F

The majority of the positive samples were from columns, beams, railings, windows and doors; however, positive samples were also collected from stairs, ladders, a wall, an elevator, and a fire escape. A report containing all of the XRF results is contained in Appendix M. A summary of the positive sample results (> 1.0 mg/cm^2) is contained in Table 4-12.

4.3.6.2 Paint Chips

Whenever the XRF instrument readings were inconclusive (i.e., it was not possible to determine definitively if the reading was ≥ 1 mg/cm^2), paint chip samples were collected for laboratory analysis to confirm the presence of lead. A total of 13 paint chip samples were collected (five from Building No. 33; four from Building No. 34; and four from Building No. 35). None of the paint chip sample results indicated the presence of lead at a concentration above 1 mg/cm^2. The paint chip sample locations are presented on Figures 4-9 through 4-13. A summary of the results is presented in Table 4-13.

4.3.7 Building Materials - TCLP Parameters

Analysis of ten on-site building material samples (e.g., sheet rock, floor material, cinder block, red brick) indicated the presence of nine separate TCLP parameters (six VOCs, two pesticides, and one herbicide); however, only one (5,700 µg/L of 1,2-dichloroethane in sample BM-TCLP-08) was detected at a concentration that exceeded the RCRA TCLP regulatory limit (500 µg/L). This sample was collected from the exterior of Building No. 33. No SVOCs or metals were detected in any of the samples. The building material sample locations are shown on Figures 4-10 through 4-13.

4.3.8 Building Materials - Wipe Samples

A total of 14 wipe samples were collected from the on-site buildings (six from Building No. 33; four from Building No. 34; and four from Building No. 35). The sample locations are presented in Figures 4-10 through 4-13. All wipe samples were analyzed for Full TCL/TAL, including cyanide, total phenols and PBBs. Due to a miscommunication with the laboratory, the VOC analysis was canceled, therefore, no VOC data are available for the wipe samples. A summary of the wipe sampling results is presented in Table 4-14. No federal or state ARARs/TBCs exist for wipe samples.

A total of 24 SVOCs were detected in the wipe samples; 24 SVOCs in Building No. 33, 18 SVOCs in Building No. 34, and seven SVOCs in Building No. 35. The total SVOCs[15] detected ranged in concentration from 2,045 µg/kg to 125,818 µg/kg.

A total of eight pesticides were detected in the wipe samples; no PCBs were detected. Three pesticides were detected in Building No. 33; seven pesticides were detected in Building No. 34; and four pesticides were detected in Building No. 35. The total pesticides detected ranged in concentration from 18 µg/kg to 1,604 µg/kg.

Detectable levels of PBBs were present in ten wipe samples; four from Building No. 33, four from Building No. 34; and two from Building No. 35. The PBBs ranged in concentration from 8 µg/kg to 912 µg/kg.

A total of 21 metals were detected in the wipe samples; cyanide was not detected in any

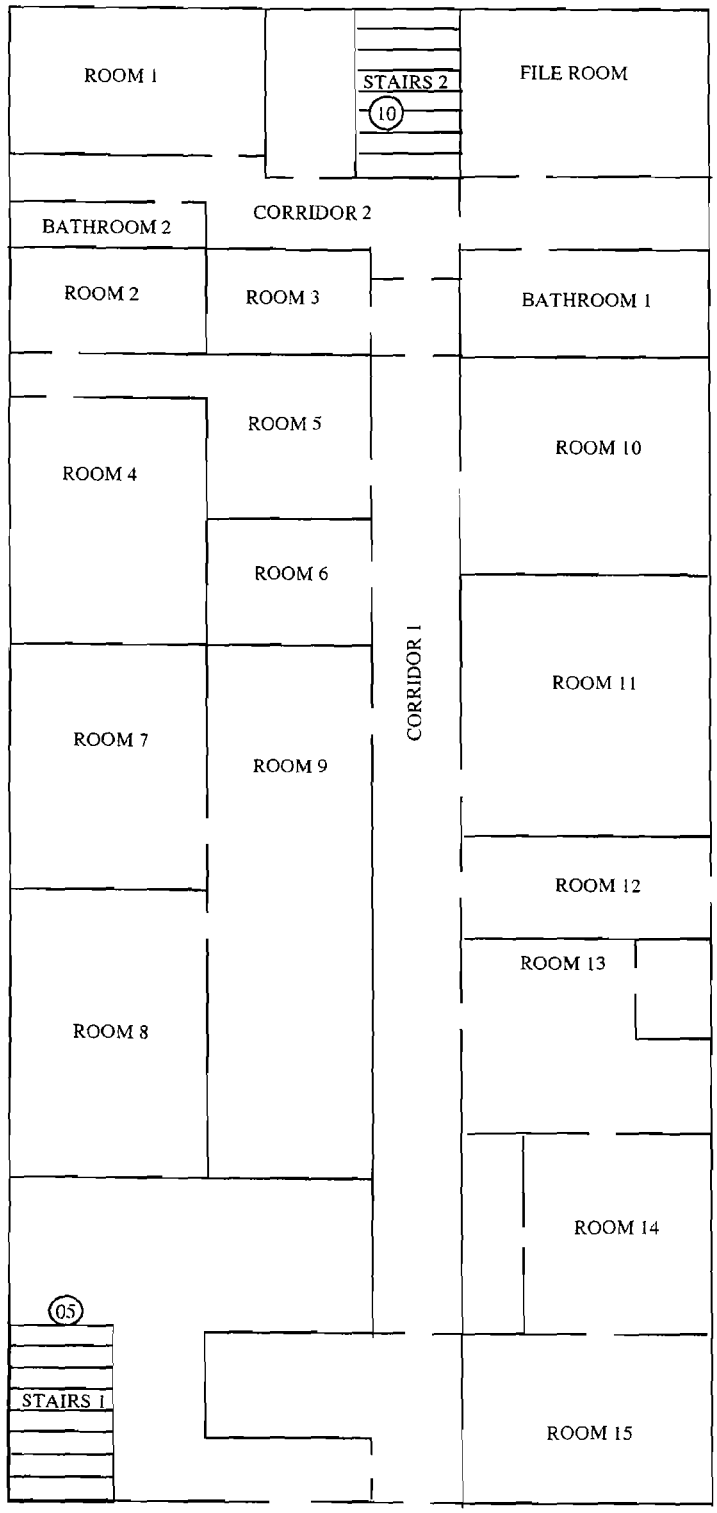
[15]Total concentrations refer to the sum of concentrations of all the detected compounds in a particular fraction.

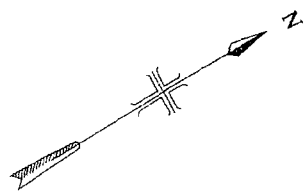
TABLE 4-12
SUMMARY OF XRF POSITIVE RESULTS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Building	Testing Combination	Range of XRF Readings (mg/cm^2)
Bldg. 33, 1st Floor	Grey Metal Window Sash	2.1 - 2.5
	Orange Metal Railing	3.5 - 4.2
	White Steel Column	1.7 - 1.9
	White Steel Beam	1.9 - 2.3
	Grey Metal Elevator Door Casing	1.5
	Brown Steel Beam	2.3 - 2.9
	Brown Metal Stairs Stringer	2.0 - 2.2
Bldg. 33, 2nd Floor	Brown Metal Railing	2.2 -3.7
	Orange Metal Ladder	2.2
	White Steel Column	2.0
Bldg. 33, West Exterior	Yellow Metal Railing	1.4 - 1.7
	Red Steel Column	1.5
Bldg. 34	Green Metal Wall	1.4 - 1.6
	Blue Wood Door Casing	1.3
	Green Metal Pipe	2.5
	Yellow Metal Railing	1.9
	Red Steel Column	>9.9
Bldg. 35, 1st Floor	Green Metal Door Header	2.3 - 2.9
	Grey Metal Fire Escape	4.4 - 6.2
	Green Metal Door Casing	4.6 - 9.0
	Green Metal Window Sash	1.5
	Green Metal Door Jamb	2.7
	Green Steel Column	1.5 - 2.0
	Red Steel Column	1.7 - 4.2
	Green Steel Column	1.6
	Red Steel Column	1.6 - 1.8
	Green Metal Door Jamb	1.6
	Green Steel Column	1.8 - 2.5

TABLE 4-12
SUMMARY OF XRF POSITIVE RESULTS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Building	Area	Testing Combination	Range of XRF Readings (mg/cm^2)
Bldg. 35, 2nd Floor	008	Green Metal Elevator Casing	5.5 - 7.8
	008	Green Steel Beam	2.4 - 3.0
	008	Green Steel Column	1.7
	009	Green Steel Column	1.6 - 2.9
	010	Green Steel Column	1.6
	011	Green Steel Column	2.5
	013	Green Steel Column	2.0 - 2.1
	015	Green Steel Column	2.0 - 2.7
	017	Green Metal Ladder	3.7 - 6.5
Bldg. 36	002	Grey Steel Beam	1.8 - 2.6
Boiler Room	001,Exterior	Brown Metal Door Jamb	4.3 - 5.4
	001	Green Metal Door Jamb	2.8 - 3.2
Pump House	001,Exterior	Brown Metal Door	3.0 - 4.9
	001	Grey Metal Door Casing	1.7 - 1.8
	001	Grey Metal Door	2.1 - 2.3





LEGEND

(65) PAINT CHIP SAMPLE LOCATION

NOTE: ALL VALUES FOR LEAD IN THE PAINT CHIP SAMPLES ARE<1.0mg/CM^2

NOT TO SCALE

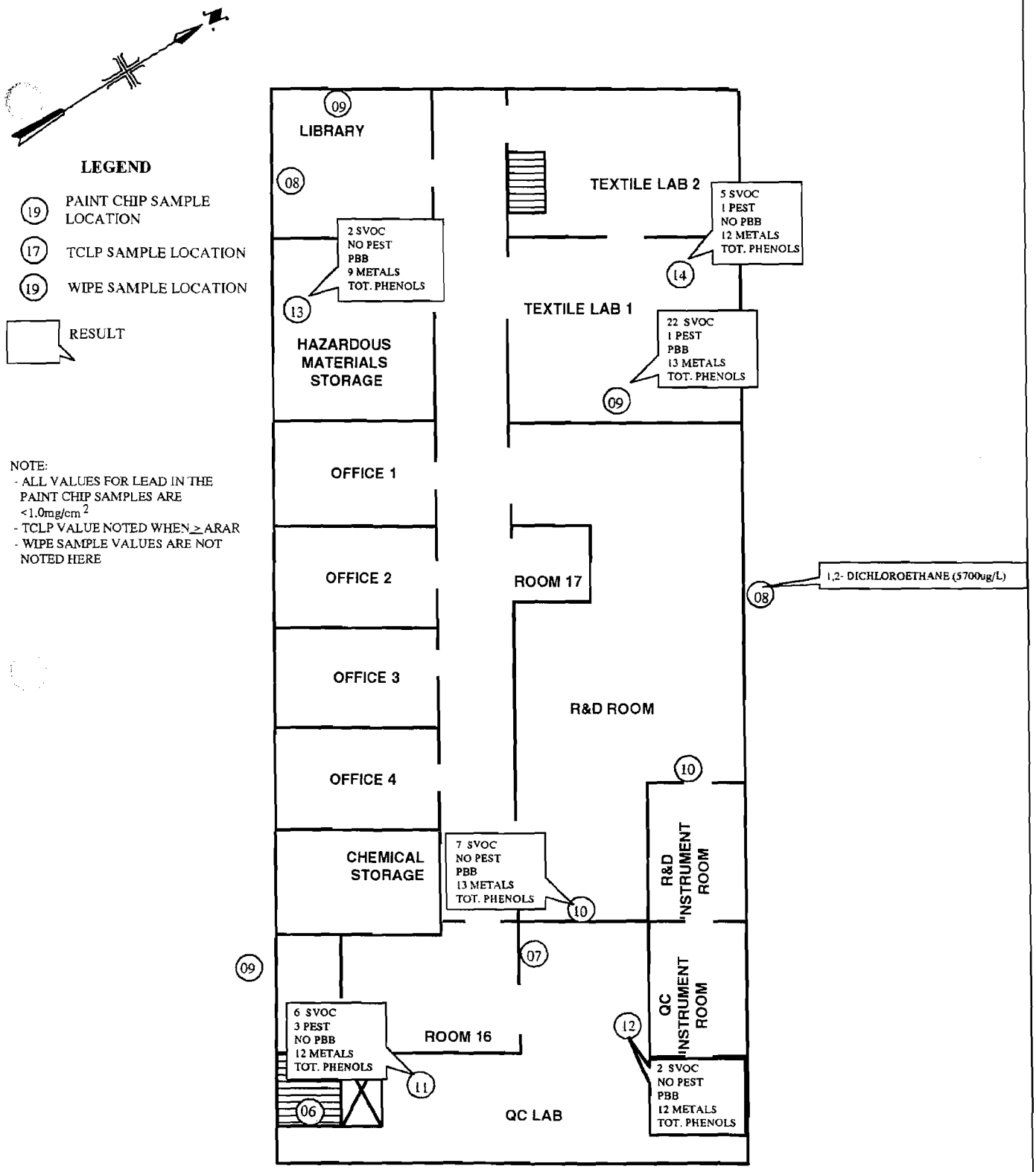
MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BUILDING NO. 33, FIRST FLOOR
PAINT CHIP SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

FIGURE 4-9



SOURCE: ROY F. WESTON, INC.
MAJOR PROGRAMS DIVISION

NOT TO SCALE

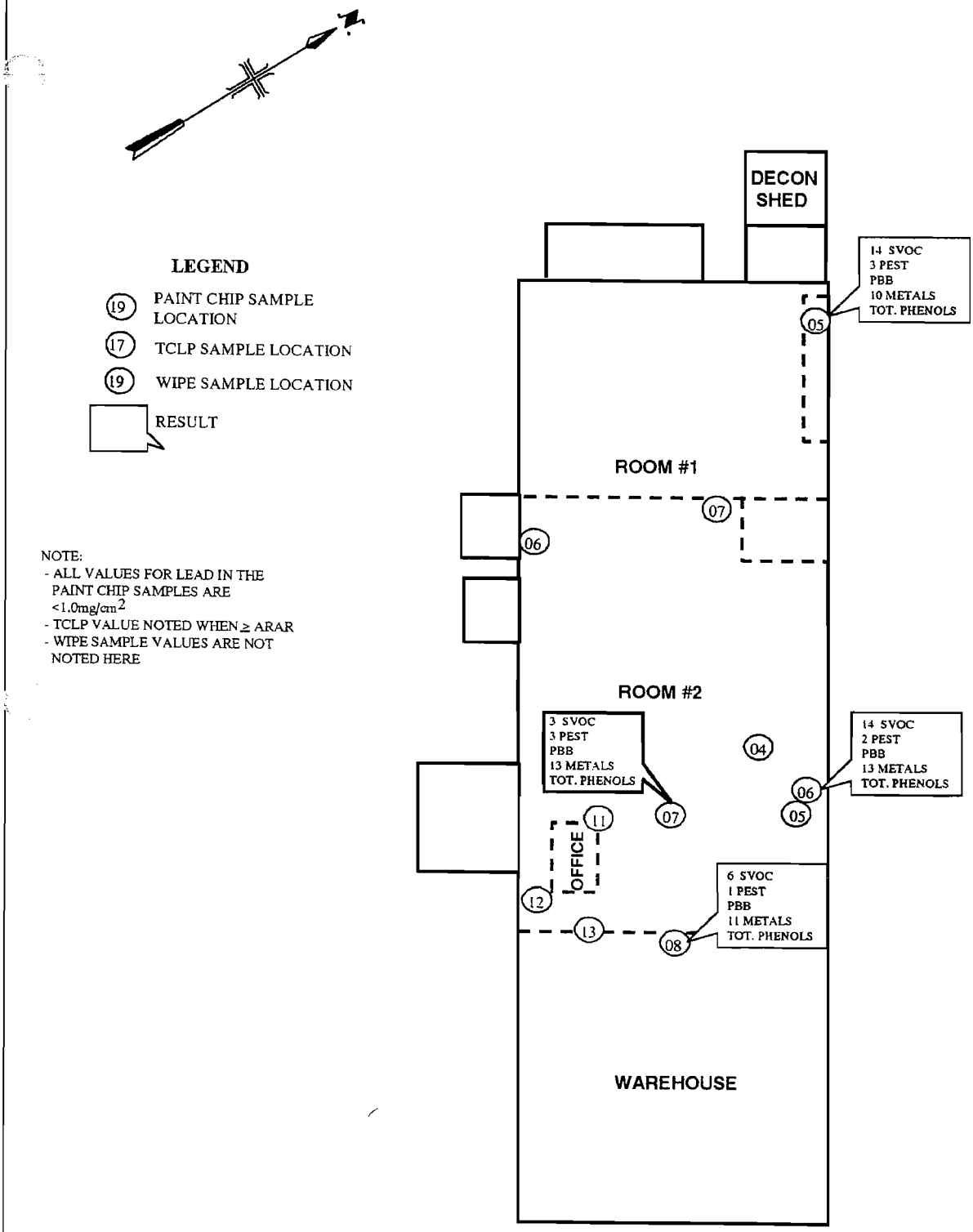
MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BUILDING NO. 33, SECOND FLOOR
PAINT CHIP, TCLP, WIPE SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

FIGURE 4-10



SOURCE: ROY F. WESTON, INC.
MAJOR PROGRAMS DIVISION

NOT TO SCALE

MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BUILDING NO. 34
PAINT CHIP, TCLP, WIPE SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

FIGURE 4-11

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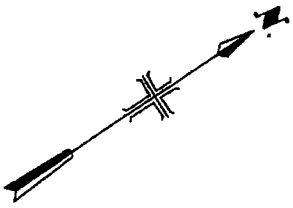
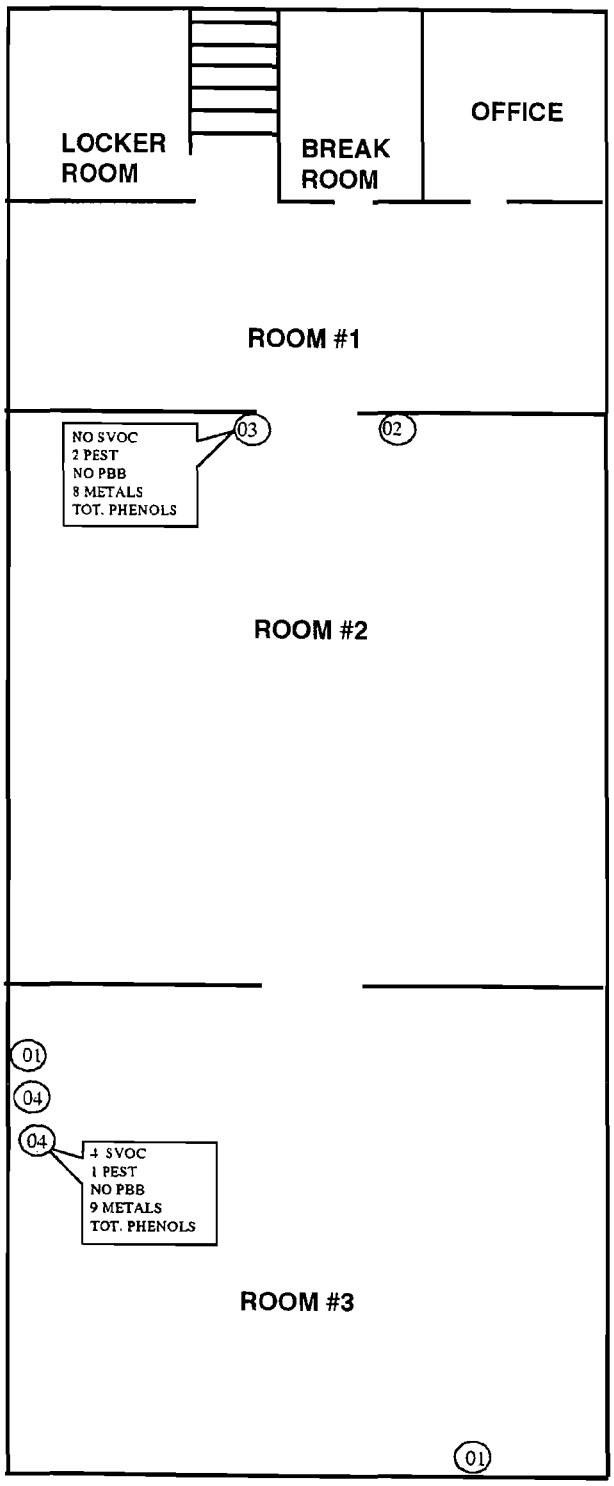




LEGEND

- (19) PAINT CHIP SAMPLE LOCATION
- (17) TCLP SAMPLE LOCATION
- (19) WIPE SAMPLE LOCATION
- RESULT

NOTE:
- ALL VALUES FOR LEAD IN THE PAINT CHIP SAMPLES ARE <1.0mg/cm^2
- TCLP VALUE NOTED WHEN $\geq$ ARAR
- WIPE SAMPLE VALUES ARE NOT NOTED HERE

SOURCE: ROY F. WESTON, INC.
MAJOR PROGRAMS DIVISION

NOT TO SCALE

P:\3020004\NTBLDG2ZIP.PPT

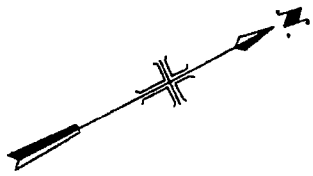
MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BUILDING NO. 35, FIRST FLOOR
PAINT CHIP, TCLP, WIPE SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

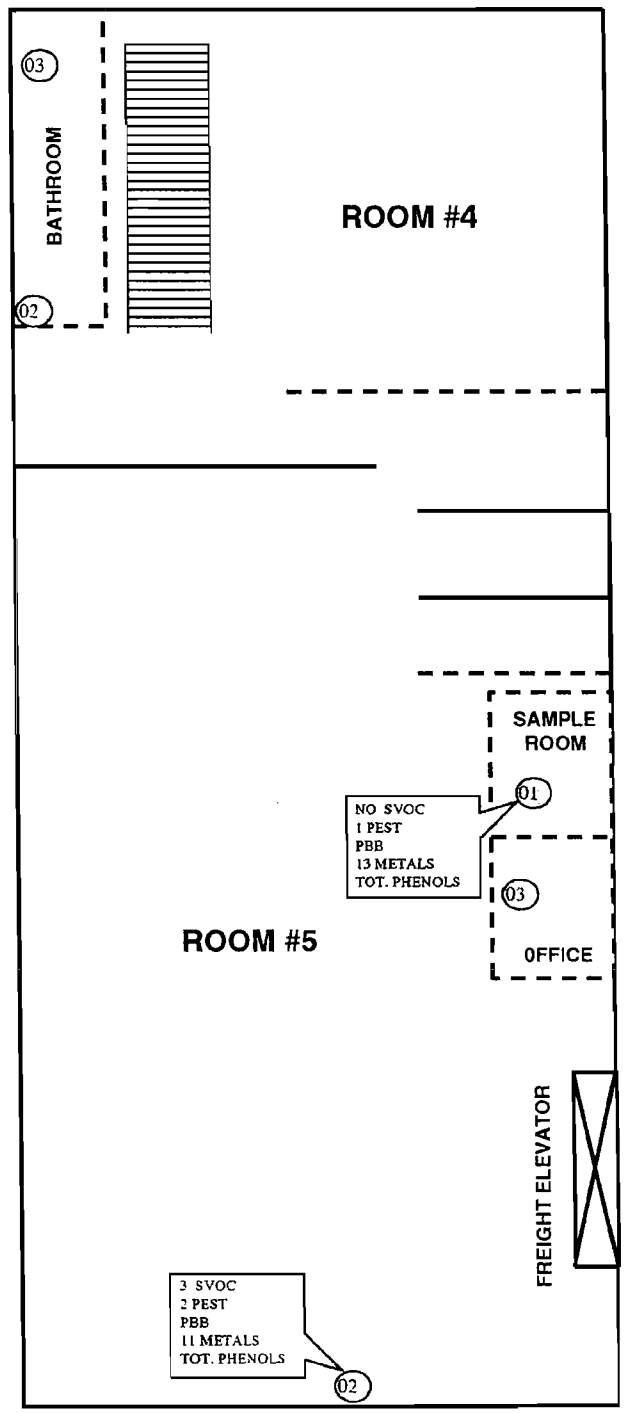
FIGURE 4-12



LEGEND

- (19) PAINT CHIP SAMPLE LOCATION
- (17) TCLP SAMPLE LOCATION
- (19) WIPE SAMPLE LOCATION
- RESULT

NOTE:
- ALL VALUES FOR LEAD IN THE PAINT CHIP SAMPLES ARE $<1.0 mg/cm^2$
- TCLP VALUE NOTED WHEN ≥ ARAR
- WIPE SAMPLE VALUES ARE NOT NOTED HERE



SOURCE: ROY F. WESTON, INC.
MAJOR PROGRAMS DIVISION

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MALCOLM PIRNIE

WHITE CHEMICAL CORPORATION REMEDIAL INVESTIGATION
NEWARK, NEW JERSEY

BUILDING NO. 35, SECOND FLOOR
PAINT CHIP, TCLP, WIPE SAMPLE LOCATIONS

MALCOLM PIRNIE, INC.

FIGURE 4-13

TABLE 4-13
SUMMARY OF LEAD PAINT CHIP SAMPLE RESULTS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Sample No.	Building No.	Description	Result (mg/cm^2)
PB-01	35	Greyish green paint on concrete block wall	0.0990
PB-02	35	Green paint on plaster	0.0385
PB-03	35	Green paint on sheet rock above office door	0.0183
PB-04	35	White paint on concrete block wall	0.0340
PB-05	33	White paint on concrete block in stairs	0.00088
PB-06	33	Grey paint on concrete floor	0.0231
PB-07	33	Peach paint on sheet rock	0.00029
PB-08	33	Off-white paint on sheet rock	0.1830
PB-09	33	Peach/Green paint on window sill block	0.1650
PB-10	33	Peach/Green paint on plaster	0.0291
PB-11	34	Blue paint on concrete block wall	0.1950
PB-12	34	Green paint on concrete block wall	0.013
PB-13	34	Dark green paint on steel wall	0.3800

TABLE 4-14
SUMMARY OF WIPE SAMPLING RESULTS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Sample No.	Building No.	Total SVOCs (in µg/kg)	Total Pesticides (in µg/kg)	Total PBBs (in µg/kg)	Total Metals (in mg/kg)
WIPE-01	35	non-detect	18	912	5,738
WIPE-02	35	2,045	623	24	30,588
WIPE-03	35	non-detect	222	non-detect	3,419
WIPE-04	35	26,977	49	non-detect	3,810
WIPE-05	34	8,571	1,604	279	2,962
WIPE-06	34	20,933	1,320	130	13,270
WIPE-07	34	25,818	1,565	296	29,364
WIPE-08	34	5,000	41	8	21,342
WIPE-09	33	19,302	38	64	20,298
WIPE-10	33	5,370	non-detect	100	2,527
WIPE-11	33	35,000	1,105	non-detect	32,864
WIPE-12	33	17,544	non-detect	600	1,850
WIPE-13	33	15,152	non-detect	275	971
WIPE-14	33	34,746	22	non-detect	3,839

of the samples. Twenty-one metals were detected in Building No. 33, 20 metals were detected in Building No. 34, and 20 metals were detected in Building No. 35. The total metals detected ranged in concentration from 971 mg/kg to 32,864 mg/kg.

4.4 CONCEPTUAL SITE MODEL

The following conceptual Site model was developed to bring together the hydrogeological and chemical information collected during the RI and attempt to reach an understanding of what is occurring in the soil and groundwater. Results of the field investigation are not sufficient to develop a complete understanding of contaminant sources, distribution and migration at the Site because several areas described below remain uncharacterized.

4.4.1 Hydrogeology

A simplified geologic cross-section of the Site consists of 22-44 feet of silty sand overlying bedrock. There is a five to 16-foot layer of silt and clay (possibly representing weathered bedrock) immediately overlying bedrock. Bedrock consists of soft red shales of the Passaic Formation (a source of groundwater in the region). The surface of the bedrock appears relatively flat in the northern portions of the Site, but dips in a southeasterly direction in the southern portion of the Site.

There is a groundwater divide created by mounded groundwater in the vicinity of Building No. 34 that results in **radial** groundwater flow in a southerly, easterly and northerly direction. The groundwater mound may be created by a flooded tunnel and/or sump in Building No. 34 that is recharging groundwater. Synoptic water level measurements in the four pairs of shallow and deep wells (MW-1S/1D, MW-3S/3D, MW-5S/5D and MW-7S/7D) also indicate a downward vertical gradient across the Site.

4.4.2 Contaminant Source, Distribution and Migration

Soils that are not completely characterized include areas under building floors and sumps, the area around the AGST farm and anomalies in the geophysical survey results. The source(s) of the contamination in groundwater has not been definitively identified. The concentration of many VOCs in the groundwater are higher than those same constituents in soil. In general, soil contamination is limited to the upper two feet in areas that were completely characterized. The monitoring wells along the periphery of the Site (MW-1S/1D, MW-2, MW-3S/3D and MW-5S/5D) reflect levels of VOCs that exceed federal ARARs or state TBCs. It appears that contaminantsin groundwater may have migrated off-Site and, therefore, the full horizontal extent of groundwater contamination is undefined.

A comparison of the concentration gradient of several constituents reflect an increasing concentration gradient with depth. For example, at MW-7D, the concentration of 1,2-dichloroethane is sufficiently high to indicate the presence of a dense non-aqueous phase liquid (DNAPL). This was determined by comparing the maximum concentration of 1,2-dichloroethane in MW-7D (260 mg/L) to 1% of its solubility factor (a common indicator of the potential for DNAPL). It is likely, therefore, that DNAPL is present at the Site and has migrated at least to the top of the weathered bedrock. It appears that contaminants in the groundwater have migrated vertically, however, the full vertical extent of groundwater contamination is undefined. Monitoring of the groundwater in bedrock was beyond the scope of this RI, however, it is also possible that DNAPL has migrated into the bedrock.

5.0 FATE AND TRANSPORT

5.1 INTRODUCTION

There are numerous chemical and biological processes as well as environmental factors that determine the fate of contaminants in the environment. This section will examine and evaluate potential routes of migration and the factors and processes that affect them. Both chemical-specific and site-specific factors that influence fate and transport will be addressed. It should be noted that the discussion is predominantly qualitative in nature; no quantitative modeling effort was undertaken as part of this analysis.

5.2 TRANSPORT PROCESSES

5.2.1 Advection

Advection is the process of transporting a contaminant through flow in an aqueous medium (e.g., groundwater). It is the primary means for soluble compounds to be transported in the subsurface and may also serve as a transport mechanism for liquids that are immiscible with water. Chemical-specific factors that could affect transport by advection include water solubility and the partition coefficients[1] [organic carbon partition coefficient (K_{oc}) and octanol/water partition coefficient (K_{ow})]. Water solubility is defined as the maximum concentration of a chemical that can be dissolved in pure water at a specified temperature. Highly soluble chemicals are more likely to be transported by advection than less soluble chemicals since they persist in solution in the groundwater.

The partition coefficients represent the tendencies for chemicals to distribute among different phases. The K_{oc} estimates the extent to which a chemical will partition between organic carbon and water at equilibrium, while the K_{ow} estimates the extent to which a chemical will partition between octanol and water at equilibrium. Advection could be important for transporting chemicals with low K_{oc} or K_{ow} values since these contaminants will preferentially migrate into the groundwater. Chemicals with high K_{oc} or K_{ow} values are unlikely to solubilize in the groundwater since they bind tightly to the organic matter in soil.

5.2.2 Dispersion

Dispersion is the transport of a dissolved solute from a region of higher concentration to a region of lower concentration and typically results in radial dispersion from the source of groundwater contamination. The rate of dispersion is a function of the difference in concentration between the source area and the uncontaminated area.

5.2.3 Attenuation onto Soils

There are a number of mechanisms that result in the attenuation of organic and inorganic compounds onto soils including sorption, ionic exchange and isomorphic substitution. All of

[1]It should be noted that partition coefficients represent equilibrium states, while actual compound sorption may occur in multiple stages with different rates prior to equilibrium.

these mechanisms are influenced by solubility of a chemical, K_{oc}, and K_{ow}. Sorption is the removal of a solute from the aqueous phase by attachment of the solute to a particle. Sorption of contaminants can greatly reduce the mobility of a contaminant but will not affect its mass or toxicity. The reduction in mobility may result in a substantial reduction in public health and ecological risk, but is often accompanied by a reduction in biodegradation due to reduced bioavailability. Ion exchange is the interchange of ions between two chemicals. Anion and cation exchange are sorption phenomena associated with specific ionic species that are usually inorganic in nature. Isomorphic substitution occurs during the formation of clays when inorganic ions are substituted for Magnesium $(Mg)^{2+}$ and Aluminum $(Al)^{3+}$. Isomorphic substitution is not expected to be a significant source of removal of cationic metal contaminants at a polluted site.

5.2.4 Facilitated Transport

Facilitated transport is any process that increases the rate of mobility of a contaminant beyond that expected based solely on idealized Darcian flow and equilibrium sorptive interactions. It is caused by the combined effects of two or more physical or chemical processes. This increased rate of mobility may occur when cosolvents, surfactants, or colloidal particles are present in the environment. Facilitated transport is most commonly associated with hydrophobic organic compounds (HOCs) such as PCBs, pesticides, polycyclic aromatic hydrocarbons (PAHs) (a subset of SVOCs), and heavy metal species that have a high affinity for surfaces.

Cosolvation is the process where the mobility of one contaminant is increased by the presence of another. This occurs when a miscible organic compound (e.g., acetone) that increases the solubility of a contaminant is present at significant concentrations. Since many contaminated sites often have multiple contaminant sources it is not uncommon to find strongly sorbing organic compounds and metals as well as miscible organic compounds. Surfactants, like miscible organic compounds, can also increase the solubility of a contaminant. Surfactants are found naturally occurring in the environment, or they may be introduced and coincident with the source of contamination.

Particle transport occurs when contaminants adhere to a colloid (e.g., through sorption, ion exchange) that travels through an aqueous media by advection. Colloids are organic or inorganic particles that are less than 10 micrometers (μm) in diameter. Organic colloids may consist of bacteria or spores, humic substances and organic fibers, and non-aqueous phase liquids such as oil droplets and surfactant micelles. Inorganic colloids, which may be naturally occurring or from anthropogenic sources, include clays, metal oxides, and inorganic precipitates. The velocity of colloids may be faster than the velocity of the bulk fluid since colloids usually follow a more direct path than the fluid. Chemical-specific factors that could affect facilitated transport include water solubility, K_{oc}, and K_{ow}.

5.2.5 Volatilization

The volatility of a compound is a measure of the transfer of the compound from an aqueous or solid phase to the gaseous phase. The aqueous phase may include a pure liquid compound or a compound dissolved in solution. The volatilization of chemicals from a solid phase involves several steps including desorption of the contaminant from the solid, vertical migration to the soil-air interface, and vaporization into the atmosphere. Factors that affect a compound's volatilization include chemical-specific properties such as solubility, vapor pressure,

Henry's Law Constant (H), and molecular weight, as well as the physical properties of its environment such as temperature, velocity and turbulence. The vapor pressure of a chemical is directly related to the rate at which it volatilizes. Chemicals with a high vapor pressure (i.e., > 10 millimeters of mercury (mm Hg) at room temperature) tend to volatilize rapidly in an open system (e.g., soils that are exposed to the atmosphere) while chemicals with a low vapor pressure (< 1 mm Hg at room temperature) tend to bind to soil or water and are much less likely to vaporize. Henry's Law Constant, which takes into account molecular weight, solubility, and vapor pressure, is useful in characterizing a compound's tendency to volatilize. Compounds with a high H are more volatile than compounds with a low H.

Volatilization is generally observed among the group of organic compounds known as VOCs; however, certain elemental metals, such as mercury, can be volatile under ambient conditions. A number of metals also have greatly increased volatility when in an organic form such as the methylated[2] metal species. Metals that have volatile methylated species include arsenic, mercury, lead and tin.

5.3 TRANSFORMATION PROCESSES

5.3.1 Complexation

Complexation is the formation of an ion pair, typically between a metal ion and a ligand. The ligand may be organic or inorganic, and the resulting complex may result in increased or decreased mobility of the metal. The toxicity of the complex may be greater or lesser than the metal ion species alone, primarily due to the potential change in solubility of the metal.

5.3.2 Biodegradation and Biotransformation

Biodegradation is the biologically mediated (i.e., microbial or fungal) chemical breakdown of compounds from larger to smaller products. Generally, biodegradation describes the breakdown of organic contaminants to less toxic forms. Under idealized laboratory conditions, virtually all organic compounds are subject to biodegradation; however, the occurrence and rate of biodegradation at a given site are subject to a number of inter-related factors that affect bioavailability, the kinetics of biodegradation, and toxicity of a compound. Some factors that affect biodegradation include solubility, K_{OC}, and K_{OW}, degree of halogenation, the presence of toxic metals, soil type, soil/water pH, and the presence of bacteria or fungi.

Solubility, K_{OC}, K_{OW}, and soil type are all related to the tendency of a contaminant to sorb to particles. Contaminants that are tightly bound to the soil have a lower bioavailability (are less easily biodegraded) than contaminants that are not tightly bound. The degree of halogenation usually determines whether biodegradation will proceed under aerobic or anaerobic conditions. Highly halogenated compounds (e.g., PCBs) are more susceptible to anaerobic biodegradation and less halogenated compounds (e.g., vinyl chloride) are more susceptible to aerobic biodegradation. The presence of toxic metals could inhibit microbial growth and non-neutral pH values (i.e., > 8 and < 6) can hinder biodegradation processes.

The most important process for the natural biodegradation of the more highly chlorinated

[2]Methylation is the transfer of a methyl group (CH_3) to a metal.

solvents is reductive dechlorination. During this process, the chlorinated hydrocarbon is used as an electron acceptor, and a chlorine atom is removed and replaced with a hydrogen atom. Reductive dechlorination of chlorinated solvent products is associated with the accumulation of daughter products and an increase in the concentration of chloride ions.

Biotransformation refers to biologically mediated chemical changes in metal species. These processes may include oxidation, reduction, and methylation or incorporation of other chemical species that do not result in a change in oxidation state of the metal of interest. Biotransformations of metals may result in extreme changes in toxicity and/or mobility.

5.3.3 Bioactivation

Bioactivation is the biologically mediated chemical breakdown of compounds to smaller products which are carcinogenic, mutagenic, or more toxic than the original contaminants. There are many known examples of bioactivation but one of the greatest problems seen at sites containing soil and groundwater contamination is the anaerobic dechlorination of chlorinated compounds such as tetrachloroethene, trichloroethene and dichloroethene to vinyl chloride. While all of the chlorinated compounds listed above have some measure of toxicity, vinyl chloride is the most toxic. Vinyl chloride is the least oxidized of the chlorinated alkenes, therefore its dechlorination to ethylene has the slowest kinetic rate. This often results in an increase in the concentration of vinyl chloride as the more oxidized chlorinated alkenes are dechlorinated.

5.3.4 Oxidation-Reduction Reactions

Oxidation-Reduction (Redox) reactions are reactions involving electron transfers and greatly affect the mobility and toxicity of metals. Redox reactions may be chemically mediated or biologically mediated as discussed in Section 5.3.2. Among commonly observed chemical redox processes are the oxidation of reduced metal species in anoxic sediments when exposed to air or, conversely, the reduction of oxidized metal species as redox potential decreases in a given environment. Ferrous iron, which is a common reducing agent in anoxic environments, is often important in the reduction of hexavalent chromium to trivalent chromium. Under certain conditions, manganese can cause the reverse reaction and oxidize trivalent chromium to hexavalent chromium.

5.3.5 Precipitation

Precipitation is an equilibrium phenomenon where contaminants dissolved in an aqueous solution are transformed into an insoluble solid. Precipitation will occur when the water chemistry equilibrium is disturbed by a change in pH, temperature, concentration of a complexing ion, or other variable. Typically, contaminants precipitate much more easily than they solubilize so precipitation can represent a significant mechanism for decreased mobility of an inorganic species.

5.4 SITE AND CHEMICAL SPECIFIC PROCESSES

There are numerous site-specific factors that affect fate and transport of contaminants including soil characteristics, hydraulic gradient, cover material, and water quality parameters.

Each of these will be discussed below. It should be noted that extensive data regarding soil and groundwater chemistry or microbiology was not collected. Therefore, conclusive statements regarding Site factors that might influence biodegradation, biotransformation, bioactivation, oxidation-reduction reactions, precipitation or complexation cannot be made.

5.4.1 Soil Characteristics

Soil characteristics that affect fate, transport, and transformation of contaminants include TOC, CEC, pH, and soil particle size. TOC can be used to predict both the potential leachability of a chemical from contaminated soil and any retardation of the chemical as it migrates through the aquifer. The TOC in the soils at the Site vary greatly with concentrations ranging from 83 mg/kg to 212,300 mg/kg; however, the majority of the soils have concentrations greater than 10,000 mg/kg. Chemicals with a high K_{oc} and/or a high K_{ow} will tend to bind tightly to the organic matter resulting in reduced mobility. Chemicals with a low water solubility will also tend to sorb to organic matter. Generally, the higher the degree of halogenation (e.g., PCBs and tetrachloroethene are highly halogenated; vinyl chloride is less halogenated), the lower the water solubility.

VOCs, SVOCs, pesticides/PCBs, metals, and PBBs were all detected in soil at the Site. All of the VOCs detected at concentrations above the TBCs have low to moderate K_{oc} values (< 1,000), which indicates that they are moderately to weakly sorbed to organic matter. With the exception of pentachlorophenol, all of the SVOCs, pesticides/PCBs, and PBB have relatively high K_{oc} values (>1,000) and are moderately to very strongly sorbed to organic matter. There are no K_{oc} values available for the metals.

CEC refers to the number of positively charged ions a soil can hold, and can be used to predict the extent of migration of metals to groundwater. Colloidal soil particles, generally either clays or organic matter, are composed of a complex negative radical and an assortment of adsorbed cations. These adsorbed cations can be exchanged for cations dissolved in water. The higher the CEC value, the better the soil is at immobilizing metal ions and preventing the leaching of contaminants to the aquifer. However, it should be noted that immobilized contaminants that are sorbed to colloidal particles could be transported through advection.

Soil pH values can be an important factor in transformation processes (i.e., biodegradation) since most bacteria have their growth optimum at relatively neutral values (i.e., > 6 and < 8). Although there are a few outliers, the majority of the soils across the Site have pH values between 5 and 8.

Soil particle size can be used to obtain a rough estimate of the amount of percolation that may occur following precipitation. Course soils (i.e., sand) will allow extensive percolation of precipitation while finer soils will not. The Site is predominantly underlain by deposits consisting of clayey silt and fine to coarse sand. Grain size data suggest that the soils consist of poorly sorted gravel, sand, and silt and clay. The average grain size distribution, estimated from nine soil samples collected throughout the Site, consisted of approximately 7% gravel, 63% sand, and 30% silt and clay. A discussion of the Site soils is contained in Sections 3.3 and 3.4.

5.4.2 Hydraulic Gradient

The average horizontal gradient in both the upper and lower water table is approximately 0.002 feet/foot, indicating that the water table is relatively flat. Groundwater flow is likely to

follow preferential pathways that occur in the porous medium.

5.4.3 Cover Material

Cover material on a site affects volatilization of contaminants from the soil, the amount of precipitation that can percolate through the vadose zone, windborne dust and surface runoff. The majority of the ground surface at the Site is paved with either concrete or asphalt. Therefore, volatilization would contribute insignificantly as a transport process at the site. This also greatly reduces the migration of contamination through runoff and windborne dust as well as through the downward percolation of water to the groundwater. Cracks, discontinuities, and other defects on the paved surfaces are present; however, it is unlikely that they contribute significantly to the above processes.

5.4.4 Water Quality Parameters

Water quality parameters that are important factors in biodegradation processes in groundwater include dissolved oxygen, TDS, TOC, alkalinity, sulfate, and nitrate. Dissolved oxygen is the most thermodynamically favored electron acceptor used by microbes for the biodegradation of organic carbon. Anaerobic bacteria generally cannot function at dissolved oxygen concentrations greater than about 0.5 mg/L (USEPA, 1998). Dissolved oxygen concentrations at the Site ranged from 0.37 mg/L to 0.78 mg/L, with an average concentration of approximately 0.50 mg/L. Therefore, aquifer conditions are borderline anaerobic. At elevated concentrations, TDS can exert a high degree of osmotic pressure in the groundwater and can also change the chemical nature of the water. Both of these factors could inhibit or prevent microbial growth, thereby hindering biodegradation processes. TDS concentrations at the Site ranged from 142 mg/L to 2,570 mg/L; however, the highest concentrations were found in the deep water table. TOC can be used to estimate the amount of substrate (i.e., biological "food") available for microorganisms. Generally, a high organic content correlates to an increased growth of microorganisms. TOC concentrations in the groundwater at the Site ranged from 1.1 mg/L to 13 mg/L. Alkalinity measures a groundwater system's capacity for neutralizing acids and acts as a buffer against acids generated during biodegradation processes. It is important for the pH of the groundwater system to remain relatively stable since most bacteria have their growth optimum at relatively neutral pH values (i.e., > 6 and < 8). Alkalinity concentrations in the groundwater at the Site ranged from 21.3 mg/L (measured as calcium carbonate) to 299 mg/L. In general, alkalinity values were slightly higher in the deep water table.

Nitrate and sulfate can be used as indicators of a groundwater system's capacity for anaerobic biodegradation. During reductive dechlorination of chlorinated solvents, both nitrate and sulfate can be utilized by the microbes as electron acceptors[3] via denitrification and sulfate reduction, respectively. In order for reductive dechlorination to occur, nitrate concentrations in the contaminated portion of an aquifer should be less than 1.0 mg/L (USEPA, 1998). Nitrate concentrations at the Site ranged from non-detect to 6.7 mg/L; however, approximately 80% of the concentrations were less than 1.0 mg/L. Sulfate concentrations at the Site ranged from 42 mg/L to 6,200 mg/L; however, the highest concentrations were found in the shallow wells.

[3]The electrons used by microorganisms for their metabolism must be passed to an electron acceptor.

Although concentrations of sulfate greater than 20 mg/L may inhibit reductive dechlorination, reductive dechlorination has been observed in plumes with high concentrations of sulfate (USEPA, 1998). It should be noted that once the highly halogenated VOCs presently in the groundwater are further broken down, an aerobic system may be required to complete the biodegradation process (i.e., vinyl chloride to ethylene).

5.5 FATE ANALYSIS

5.5.1 Fate of Volatile Organic Compounds

As a class, VOCs generally have high water solubilities, high biodegradability under appropriate conditions, and low partition coefficients. Due to these factors VOCs tend to migrate to the groundwater faster than the other organics. These factors also indicate that the process of facilitated transport for the VOCs is probably insignificant. Relevant VOC K_{ow}, K_{oc}, vapor pressure, and water solubility values are presented in Table 5-1.

At this Site, migration of VOCs from the soils to the groundwater appears significant in some areas of the Site. This is likely due to their chemical properties (as described above), the high percentage of sand in the Site soil, and the presence of high concentrations of VOCs in the soil. The high concentration of VOCs in the soils will continue to be a source of groundwater contamination. A comparison of soil boring data to corresponding monitoring well groundwater data can provide an indication of whether VOCs in the soil are being leached to the groundwater. For instance, SB-11, which is close to MW-3S and MW-3D, exhibited high levels of trichloroethene, 1,1,2,2-tetrachloroethene, tetrachloroethane, and 1,2-dichloroethene. All of these compounds were also detected in MW-3S and MW-3D, indicating that some leaching may be occurring. MW-3D also had a very high concentration of 1,2-dichloroethane, which was not detected below 3 feet at SB-11. This suggests that there may be another source (e.g., dry well, UST) of 1,2-dichloroethane in the groundwater. This observation is supported by the data collected at MW-7S/MW-7D/SB-25. Although very high levels of 1,2-dichloroethane as well as other chlorinated VOCs were detected in both monitoring wells, no chlorinated VOCs were detected in SB-25. The VOC contamination in the groundwater is expected to be transported off-Site with the groundwater flow through the process of advection and dispersion.

All of the VOCs detected in the groundwater at concentrations that exceed the ARARs are chlorinated compounds. Since these compounds are heavier than water, they tend to migrate downward through the vadose zone and water table until they pool on top of impermeable layers to form DNAPL. Although a DNAPL layer was not visible in any of the groundwater or soil samples, it is possible that DNAPLs are present at the Site. Specifically, MW-7D may contain 1,2-dichloroethane as a non-aqueous phase liquid, since the detected concentration of 250,000 ug/L is greater than 1% of the aqueous solubility of 1,2-dichloroethane. As discussed in Section 3.3.2, the Site is underlain by deposits consisting of clayey silt and fine to coarse sand with varying amounts of silt and gravel. Underlying these deposits is the weathered shale bedrock, which is found at depths ranging from 37 feet bgs to 55 feet bgs. If DNAPL is present at the Site and it has reached the bedrock, it will flow into fractures in the bedrock, displacing the water. Since no drilling was conducted into the bedrock, any DNAPL that may be present would not have been found.

TABLE 5-1
CHEMICAL SPECIFIC PROPERTIES OF VOCs
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Chemical	K_{ow} SSG or ATSDR	K_{oc} SSG or ATSDR	P_{vap} (mm Hg) ATSDR or NTP	SG (20°C/4°C) NTP	Solubility (mg/L) SSG
1,1,1-Trichloroethane	3.02E+02	1.10E+02	1.24E+02	1.34E+00	1.33E+03
1,1,2,2-Tetrachloroethane	2.45E+02	9.33E+01	5.95, 9 at 25°C	1.60E+00	2.97E+03
1,1,2-Trichloroethane	1.12E+02	5.01E+01	22.49 at 25°C	1.44E+00	4.42E+03
1,2-Dichloroethane	2.95E+01	1.74E+01	6.10E+01	1.26E+00	8.52E+03
2-Butanone (Methyl ethyl ketone)	1.95E+00	3.55E+00	90.6 at 25°C	8.05E-01	1.36E+05
2-Hexanone	2.40E+01	No data	11.6 at 25°C	8.11E-01	2.00E+04 - 3.5E+04
4-Methyl-2-pentanone	No data	No data	90.6 at 25°C	8.05E-01	1.90E+04
Acetone	5.75E-01	5.75E-01	1.82E+02	7.91E-01	1.00E+06
Benzene	1.35E+02	5.89E+01	7.50E+01	8.77E-01	1.75E+03
Bromoform	2.24E+02	8.71E+01	5.00E+00	2.89E+00	3.10E+03
Carbon disulfide	1.00E+02	4.57E+01	2.98E+02	1.26E+00	1.19E+03
Carbon tetrachloride	5.37E+02	1.74E+02	9.00E+01	1.59E+00	7.93E+02
Chlorobenzene	7.24E+02	2.19E+02	8.80E+00	1.11E+00	4.72E+01
cis-1,2-Dichloroethene	7.24E+01	3.55E+01	200 at 25°C	1.28E+00	3.50E+03
trans-1,2-Dichloroethene	1.17E+02	5.25E+01	2.00E+02	1.26E+00	6.30E+03
Ethylbenzene	1.38E+03	3.63E+02	7.00E+00	8.67E-01	1.69E+02
Methylene chloride	1.78E+01	1.17E+01	3.49E+02	1.33E+00	1.30E+04
Styrene	8.71E+02	7.76E+02	4.3 at 15°C	9.06E-01	3.10E+02
Tetrachloroethene	4.68E+02	1.55E+02	18.47 at 25°C	1.62E+00	2.00E+02
Toluene	5.62E+02	1.82E+02	28.4 at 25°C	8.67E-01	5.26E+02
Trichloroethene	5.13E+02	1.66E+02	74 at 25°C	1.46E+00	1.10E+03
Vinyl chloride	3.16E+01	1.86E+01	2600 at 25°C	9.11E-01	2.76E+03
m-Xylene	1.58E+03	4.07E+02	6.00E+00	8.60E-01	1.61E+02
o-Xylene	1.35E+03	3.63E+02	5.00E+00	8.60E-01	1.78E+02
p-Xylene	1.48E+03	3.89E+02	6.50E+00	8.60E-01	1.85E+02

Notes:

SSG: USEPA Soil Screening Guidance: Technical Background Document. EPA/540/R-95/128. May 1996.
ATSDR: Agency for Toxic Substances and Diseases Registry. Toxicity Profiles. 1999 edition.
NTP: National Toxicology Program. Chemical Health and Safety Data. http://ntp-server.niehs.nih.gov
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Several combinations of VOCs in soil and groundwater exist at the Site including the following:

- Individual VOCs are present in both the soil and groundwater at concentrations exceeding the TBCs/ARARs;
- Individual VOCs are present in the soil at concentrations below the TBCs but are in the groundwater at concentrations that exceed the ARARs;
- Individual VOCs are present in both the soil and groundwater at concentrations below the ARARs/TBCs; and
- Individual VOCs are present in the soil but not the groundwater.

Each of these scenarios are discussed below.

Seven VOCs were detected in soil and groundwater at concentrations that exceeded the ARARs/TBCs. Although both chlorinated and non-chlorinated VOCs were detected in the Site soil, only chlorinated compounds were found in the groundwater at concentrations above the ARARs. This would be expected as the chlorinated VOCs usually have higher water solubilities and lower partitioning coefficient values than the non-chlorinated VOCs (such as xylene).

It should be noted that 1,2-dichloroethane was detected at higher concentrations in the groundwater than in the soil. Although 1,2-dichloroethane is a degradation product of some of the more highly chlorinated VOCs, because it is detected in groundwater at much higher concentrations than all of the other chlorinated VOCs, it is likely that 1,2-dichloroethane was released from the original source of contamination. 1,2-dichloroethane has relatively low partition coefficients and a high water solubility, allowing it to readily migrate through the saturated zone.

Several additional VOCs were detected in the groundwater at concentrations exceeding the ARARs. One of these (methylene chloride[4]) was detected in the soil at concentrations below the TBCs. Two others, which were not detected in the soil, are small chlorinated hydrocarbons (chloroform and 1,1-dichloroethene).

Three VOCs were detected in the groundwater at concentrations below the ARARs; two of these were also detected in the surface soils (1,1,1-trichloroethane and toluene) while the other (1,1-dichloroethane) was not detected in soils.

Finally, several VOCs were detected in the soil but not the groundwater. This is probably due to sorption to organic matter since these compounds have relatively high partition coefficients and low water solubilities compared to other VOCs found at the Site.

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[4]Methylene chloride was detected in one surface soil at a concentration that exceeded the TBCs. Since all of the other sample results were below the TBCs, this result was considered an anomaly.

Preliminary Screening for Natural Attenuation of Chlorinated Solvents

A preliminary review of groundwater data was performed to evaluate the potential for biologically-mediated reductive dechlorination of the chlorinated solvents present in groundwater. The review was performed using recent USEPA guidance (USEPA, 1998). The USEPA protocol uses a point scoring system as a preliminary step (Step 1) to evaluate the potential for anaerobic biodegradation processes. Points are awarded if certain conditions are present (e.g., if Site geochemical data are within a certain range). The total score is then compared to predetermined ranges that indicate if there is inadequate, limited, adequate, or strong evidence of anaerobic biodegradation.

The preliminary review was conducted on the data set currently available with the following limitations:

- Iron II, sulfide and methane, required by the USEPA protocol, were not available.
- Oxygen reduction potential (ORP) data were not available at three well locations.
- Background chloride concentrations are unknown (the USEPA protocol utilizes a comparison to background data to evaluate scoring for this parameter).

Step 1 of the protocol was performed on all well clusters using the second round of groundwater sampling data (July 1999). As discussed previously, MW-7D has concentrations of 1,2-dichloroethane greater than 1% of its aqueous solubility limit and is, therefore, likely in or near a NAPL zone. Other highly contaminated groundwater areas (i.e., areas with the concentration of one or more chlorinated organic compounds arbitrarily above 10 mg/L) included monitoring well clusters MW-1 and MW-3. Scores were calculated for wells MW-1S, MW-1D, MW-3S, MW-3D, MW-7S, and MW-7D. The scores for the wells all indicate that there is limited evidence to support the conclusion that anaerobic biodegradation is occurring at the Site.

As an example of a downgradient well cluster not in a highly contaminated zone (i.e., no individual compounds with concentrations arbitrarily above 10 mg/L), MW-5S/MW5D were evaluated. The scores for both wells indicate that there is limited evidence to support the conclusion that anaerobic biodegradation is occurring at the Site. Certain observations regarding the Site are worth noting, however:

- Source areas (contaminated soil) still exist and NAPL may also be present. Natural attenuation is typically not a viable solution unless source areas are remediated or otherwise controlled.
- In general, 1,2-dichloroethane has the greatest concentration of any chlorinated organic in the deep wells. Evidence of reduction of 1,2-dichloroethane to chloroethane (its typical daughter product) is weak or does not exist.
- There may be reductive dechlorination of chlorinated ethenes (tetrachloroethene, trichloroethene, dichloroethene). In general, vinyl chloride, a typical intermediate or end product or reduction of these compounds is not detected at the Site.

- 1,1,2,2-Tetrachloroethane and 1,1,2-Trichloroethane exist at the Site in areas proximate to each other. 1,1,2-Trichloroethane is known to be an abiotic transformation product of 1,1,2,2-Tetrachloroethane. The extent to which abiotic transformations are occurring at the Site is not known and has not been evaluated.

- Dissolved oxygen concentrations average 0.5 mg/L.

- ORP levels tend to indicate moderate reducing conditions (ORP < 50 mV).

- Nitrate values are low, typically below 1 mg/L. Elevated nitrate may inhibit biodegradation.

- Collection and evaluation of iron II, sulfide, methane, ORP, and chloride can only (assuming data are within typical ranges) result in a conclusion of equivalent or increased potential for anaerobic biodegradation.

5.5.2 Fate of Semi-Volatile Organic Compounds

As a class, SVOCs generally have relatively high partition coefficients and low water solubilities. The majority of the SVOCs detected in the soil at concentrations above the TBCs were PAHs, a subclass of the SVOCs. PAHs have very high sorption coefficients and are usually strongly to very strongly sorbed to organic matter. In addition, many PAHs are relatively insoluble in water. Relevant K_{ow}, K_{oc} and solubility values for specific SVOCs are presented in Table 5-2. Due to these factors, SVOCs are more likely to be sorbed to the organic matter in surface soil than migrating down the soil column although minimal migration could occur through large volume spills, cosolvent facilitated transport, or a combination of factors.

At this Site, migration of SVOCs from soils to the groundwater is not significant. It is likely that the large quantity and high concentration of SVOCs in the surface and subsurface soil will continue to slowly leach into the groundwater at the Site. However, dilution of the trace SVOC levels in the plume could cause the SVOCs to be undetectable at a moderate distance from the Site. In addition, sorption onto soils in the water table will occur wherever the opportunity exists.

SVOCs were detected in surface and subsurface soils throughout the Site, often exceeding the TBCs. Trace levels of SVOCs were found in the groundwater samples; however, none of the concentrations detected exceeded the ARARs. In general, the number of SVOCs found, as well as the concentrations detected, decrease with soil depth. For example, naphthalene was found at a maximum concentration of 480,000 E µg/kg in surface soil. The highest concentration detected in the subsurface soil (34,000 E µg/kg) is more than an order of magnitude lower while only a trace level of this compound (1 J µg/l) was found in the groundwater.

It is likely that a portion of the PAHs found is attributable to the asphalt pavement and/or the presence of historic fill. The presence of PAHs along with benzene, toluene, ethylbenzene, and xylene (BTEX) also indicates that spills of diesel and/or gasoline may have occurred at the Site. In many cases, gasoline spills can be large in volume, causing gasoline to saturate the

TABLE 5-2
CHEMICAL SPECIFIC PROPERTIES OF SVOCs
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Chemical	K_{ow} SSG or ATSDR	K_{oc} SSG or ATSDR	P_{vap} (mm Hg) ATSDR or NTP	SG (20°C/4°C) NTP	Solubility (mg/L) SSG or ATSDR
1,2-Dichlorobenzene	2.69E+03	6.17E+02	1.5 at 25°C	1.3048	156
1,4-Dichlorobenzene	2.63E+03	6.17E+02	1.76 at 25°C	1.2475	73.8
2,2'-oxybis (1-Chloropropane)	No data	No data	350	No data	No data
2,4-Dimethylphenol	2.29E+02	2.09E+02	0.0621	0.965	7870
2,4-Dinitrophenol	3.55E+01	1.00E-02	1.49E-05 at 18°C	1.683	2790
2-Methylnaphthalene	7.24E+03	2.45E+03	0.068	1.0058	24.6
2-Methylphenol	9.77E+01	9.12E+01	1.0 at 38.2°C	1.047	26,000
4-Bromophenyl-phenyl ether	No data	No data	No data	1.4208	No data
4-Methylphenol	No data	No data	0.04	1.0341	No data
1,2,4-Trichlorobenzene	1.02E+04	1.78E+03	1 at 38.4°C	1.454	300
Acenaphthene	8.32E+03	7.08E+03	0.00447	1.0242 (90°C/4°C)	4.24
Acenaphthylene	1.17E+04	2.51E+01	0.029	0.8988 (16°C/2°C)	3.93
Anthracene	3.55E+04	2.95E+04	1.70E-05 at 25°C	1.25 (27°C/4°C)	0.0434
Benzo(a)anthracene	5.01E+05	3.98E+05	2.20E-08	No data	0.0094
Benzo(a)pyrene	1.29E+06	1.02E+06	5.60E-09	> 1	0.0016
Benzo(b)fluoranthene	1.58E+06	1.23E+06	5.00E-07	No data	0.0015
Benzo(g,h,i)perylene	3.16E+06	1.58E+06	1.03E-10 at 25°C	No data	0.00026
Benzo(k)fluoranthene	1.58E+06	1.23E+06	9.59E-11	No data	0.00080
bis(2-Ethylhexyl)phthalate	2.00E+07	1.51E+07	6.20E-08 at 25°C	0.981	0.34
Butylbenzylphthalate	6.92E+04	5.75E+04	8.60E-06 at 25°C	1.116 (25°C/25°C)	2.69
Carbazole	3.89E+03	3.39E+03	60	1.10 (18°C/4°C)	7.48
Chrysene	5.01E+05	3.98E+05	6.30E-07 at 25°C	1.274	0.0016
Dibenz(a,h)anthracene	4.90E+06	3.80E+06	1.00E-10	No data	0.0025
Dibenzofuran	No data	No data	No data	1.0886 (99°C/4°C)	No data
Diethylphthalate	3.16E+02	2.88E+02	1.65E-03 at 25°C	1.73	1080
Di-n-butylphthalate	4.07E+04	3.39E+04	1.00E-05 at 25°C	1.047 (20°C/20°C)	11.2
Di-n-octylphthalate	1.15E+08	8.32E+07	No data	No data	0.02
Fluoranthene	1.32E+05	1.07E+05	5.00E-06 at 25°C	1.252 (0°C/4°C)	0.206
Fluorene	1.62E+04	1.38E+04	3.20E-04	1.203 (0°C/4°C)	1.98
Hexachlorobenzene	7.76E+05	5.50E+04	1.09E-05	No data	6.2
Hexachloroethane	1.00E+04	1.78E+03	0.4	2.091	50
Indeno(1,2,3-cd)pyrene	4.47E+06	3.47E+06	1.00E-08	No data	0.000022
Naphthalene	2.29E+03	2.00E+03	0.87	1.162	31
N-nitrosodiphenylamine	1.45E+03	1.29E+03	0.1	1.23	35.1
Pentachlorophenol	1.23E+05	5.89E+02	1.10E-04	1.978 (22°C/4°C)	1950
Phenanthrene	2.82E+04	1.41E+04	6.8E-04 at 25°C	1.025	1.2
Phenol	3.02E+01	2.88E+01	0.41 at 25°C	1.0576 (41°C/4°C)	82800
Pyrene	1.29E+05	1.05E+05	2.5E-06 at 25°C	1.271 (23°C/4°C)	0.135

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immediate surface soils. Subsequent migration of the oil SVOC component downward by cosolvent with the VOC component would have continued until there was sufficient dilution within the volume of the vadose zone for sorption to overcome migration. Slight fluctuations in the sorption equilibrium could occur due to fluctuations in weather conditions (atmospheric pressure, precipitation, and/or temperature) which may result in minor leaching of the sorbed SVOCs. This may account for the trace amount of SVOCs present in the groundwater. Other solvent spills that may have occurred could also carry the SVOCs to the groundwater. When the volume of a spill does not saturate the surface soil, or when the SVOCs are not present as the result of spills (e.g., leaching from the asphalt), SVOCs are more likely to be found sorbed to organic matter in the surface soil than migrating down the soil column.

5.5.3 Fate of Pesticides/PCBs

As a class, pesticides/PCBs generally have high sorption coefficients, low biodegradability, and are either insoluble in water or have very low water solubilities. Due to these factors, it is unlikely that they will migrate from the soil to the groundwater at significant concentrations although they could potentially migrate through facilitated transport. Relevant K_{ow}, K_{oc} and solubility values are presented in Table 5-3.

Pesticide/PCBs were detected in several surface soil samples at concentrations exceeding the TBCs; however, only trace amounts (well below ARARs/TBCs) were detected in the subsurface soil and groundwater samples. This indicates that migration of these chemicals at the Site is minimal. Since pesticides/PCBs were detected at very low concentrations in the vadose zone ($\leq$ 150 µg/kg) and groundwater ($<$ 0.3 µg/l), facilitated transport does not appear to be a significant factor at this Site.

Although the exact source(s) of the pesticides are unknown, there is no evidence that they were products of the Site's activities. Individual PCB compounds (non-Aroclors) may have been inadvertently produced during the Site's production of PBBs. Pesticides/PCBs are known for their persistence in the environment, and their presence at the Site may be from pest control applications decades ago. The pesticides/PCBs were found mainly along the boundaries of the large open field in the southeast portion of the Site. Given the generally low water solubility and high sorption coefficient of pesticides/PCBs, long term sorption onto the organic soil layer on the surface of the Site (where currently found) is expected.

5.5.4 Fate of PBBs

PBBs are similar to PCBs and do not occur naturally in the environment. PBBs are widely used chemicals, and were specifically processed at the Site as flame retardants. Like PCBs, PBBs do not burn easily and are good for insulating materials. They are nearly insoluble in water; however, they are slightly to highly soluble in organic solvents and are highly soluble in fat. PBBs are highly stable, heat resistant compounds that resist metabolic breakdown in biological tissues. Although they are chemically unreactive, some of the isomers reportedly photodegrade through reductive debromination upon exposure to ultraviolet light.

PBBs were detected in several surface soil samples; however, they were only detected in one subsurface soil sample. In addition, only trace amounts were detected in the groundwater samples, indicating that mobility of PBBs down the soil column and into the groundwater is extremely limited at the Site. Based on PBBs similarity to PCBs, long term sorption onto the

TABLE 5-3
CHEMICAL SPECIFIC PROPERTIES OF PESTICIDES/PCBs
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Chemical	K_{ow} SSG or ATSDR	K_{oc} SSG or ATSDR	P_{vap} (mm Hg) ATSDR	SG (20°C/4°C) NTP	Solubility (mg/L) SSG or ATSDR
4,4'-DDD	1.26E+06	1.00E+06	1.00E-06 at 30°C	1.385	0.09
4,4'-DDE	5.75E+06	4.47E+06	6.50E-06	No data	0.12
4,4'-DDT	3.39E+06	2.63E+06	5.50E-06	1.56 (15°C)	0.025
Aldrin	3.16E+06	2.45E+06	1.40E-04 at 25°C	No data	0.18
alpha-BHC	6.31E+03	1.23E+03	2.00E-02	1.87	2
beta-BHC	6.46E+03	1.26E+03	2.80E-07	1.89	0.24
gamma-BHC	No data	No data	1.70E-05	1.87	6.8
delta-BHC	2.85E+03	1.93E+03	9.40E-06	No data	17
alpha-Chlordane	2.09E+06	1.20E+05	3.00E-06	No data	0.056
gamma-Chlordane	2.09E+06	1.20E+05	3.90E-06	1.68	0.056
Dieldrin	2.34E+05	2.14E+04	7.78E-07 at 25°C	1.75	0.195
Endosulfan I	1.26E+04	2.14E+03	1.00E-05 at 25°C	No data	0.51
Endosulfan II	3.31E+03	No data	1.00E-05 at 25°C	No data	0.28
Endosulfan sulfate	4.57E+03	No data	1.00E-05 at 25°C	No data	0.117
Endrin	1.15E+05	1.23E+04	2.00E-07 at 25°C	1.7 (20°C)	0.25
Endrin aldehyde	2.36E+04	2.31E+04	2.00E-07 at 25°C	No data	50
Endrin ketone	9.77E+04	No data	No data	No data	No data
Heptachlor	1.82E+06	1.41E+06	3.00E-04 at 25°C	1.57 - 1.59	0.18
Heptachlor epoxide	1.00E+05	8.32E+04	2.60E-06	No data	0.2
Methoxychlor	1.20E+05	9.77E+04	1.40E-06 at 25°C	1.41 (25°C/4°C)	0.045
Aroclor-1254	3.80E+05	3.09E+05	7.71E-05 at 25°C	1.505 (15.5°C/4°C)	0.7
Aroclor-1260	3.80E+05	3.09E+05	4.05E-05 at 25°C	1.4	0.7

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organic soil layer on the surface of the Site is expected. It is likely that dilution of the trace amounts (parts per trillion (ppt) levels) found in the groundwater could cause the PBBs to be undetectable at a moderate distance from the Site. Sorption of PBBs onto soils in the water table will also occur wherever the opportunity exists.

5.5.5 Fate of Inorganics

Heavy metals in soil are subject to a variety of transport and transformation processes including complexation reactions, redox reactions, precipitation, attenuation onto soils, facilitated transport, and advection and dispersion when dissolved in groundwater. In general, heavy metals introduced into soil will be affected by these processes until an equilibrium condition is achieved. However, as soil conditions change the equilibrium may change, resulting in the further migration of inorganics through the soils and into the groundwater. Heavy metals are not usually affected by biodegradation of organics. The relevant solubility values are presented in Table 5-4.

At the Site, heavy metals were detected in nearly all of the surface soil samples and approximately half of the subsurface soil samples at concentrations exceeding the TBCs and Site-specific background. Numerous metals were also found in the filtered and unfiltered groundwater samples at concentrations exceeding the ARARs. In most cases, the metal concentrations detected in the unfiltered groundwater samples were much higher than the concentrations detected in the filtered groundwater samples. This indicates that many of the inorganics in groundwater are sorbed to soil particulates. Facilitated transport is, therefore, an important mechanism of transport for inorganics at the Site.

Inorganics found in the groundwater at levels exceeding ARARs include aluminum, antimony, cadmium, iron, lead, manganese, and sodium. Aluminum, iron, manganese, and sodium were all found in the soil samples at concentrations that are comparable to the Site-specific background concentration. Therefore, these metals appear to be naturally occurring and not related to the Site's activities. The remaining metals were all found in the soil samples at concentrations that exceeded the TBCs.

Antimony was detected in both the filtered and unfiltered fraction of one groundwater sample at a concentration that exceeded the ARAR. Antimony oxide is commonly added to textiles and plastics to prevent them from catching fire. In the environment, it attaches strongly to soil particulates that contain iron, manganese, or aluminum. The migration of antimony in groundwater can occur through advection-dispersion, and facilitated transport.

Cadmium was found in three unfiltered groundwater samples at concentrations that exceed the ARARs. Cadmium binds strongly to soil particulates; however, small amounts will dissolve in water. It does not break down in the environment, but can change forms. Cadmium usually forms complexes with oxygen, chlorine, or sulfur. Plants and animals can take up cadmium from the environment and bioaccumulate it up the food chain. Facilitated transport is the primary mechanism for cadmium migration in the groundwater at the Site.

Lead was found in four unfiltered groundwater samples at concentrations that exceed the ARARs. Lead, which binds strongly to soil particulates, usually needs acidic water conditions in order to move from soil to groundwater. At the Site, the groundwater pH values ranged from five to eight. Once lead becomes mobile, it is likely to remain mobile until it encounters a region of higher pH and precipitates out of solution or until it sorbs onto clay particles. Lead does not

TABLE 5-4
CHEMICAL SPECIFIC PROPERTIES OF METALS
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY

Chemical	K_{ow} ATSDR	K_{oc} ATSDR	P_{vap} (mm Hg) ATSDR	SG NTP	Solubility Chemfinder.com
Antimony	NA	NA	NA	6.684 (25°C)	Insoluble
Arsenic	No data	No data	1 at 372°C	NA	Insoluble
Beryllium	No data	No data	1 at 1520°C	NA	Insoluble
Cadmium	No data	No data	1 @ 394C	8.642 (20°C)	Insoluble
Copper	No data	No data	10 at 1870°C	NA	Insoluble. 0.01 g/100 mL
Lead	No data	No data	1.77 at 1000°C	NA	Insoluble
Mercury	No data	No data	0.002 at 25°C	NA	Very slightly soluble. 0.002 g/100 mL at 20°C
Thallium	No data	No data	10 at 1000°C	NA	Insoluble
Zinc	No data	No data	1 at 487°C	NA	Insoluble

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break down in the environment, but can change forms. Facilitated transport is the primary mechanism for lead migration in the groundwater at the Site.

6.0 SUMMARY AND RECOMMENDATIONS

The primary objective of this RI was to characterize the nature and extent of contamination associated with the Site and to provide sufficient information to subsequently perform a FS. Media sampled includes surface and subsurface soils, sump sediments, groundwater, and building materials. The results of the RI presented herein indicate that the horizontal and vertical limits of groundwater contamination are not fully defined and extend beyond the site boundaries, potential source areas remain uncharacterized in the unsaturated soil, DNAPLs may exist on the Site, and the direction of the shallow groundwater flow is not completely understood and may be influenced by a flooded underground tunnel that exists on the Site.

The secondary objective of the RI is to provide sufficient information to subsequently perform a FS. The FS will be prepared based on the information in this Final RI Report. In addition, the limitations of the RI data and the assumptions used in developing remedial cleanup alternatives will be described in the FS Report.

6.1 NATURE AND EXTENT

6.1.1 Surface and Subsurface Soil

Analysis of soil samples collected throughout the Site indicated the presence of a variety of organic and inorganic contaminants. Numerous VOCs, SVOCs, and inorganics were found in the surface and subsurface soils at concentrations that exceeded the USEPA SSLs and/or the NJDEP SCCs. Trace levels of pesticides/PCBs were also found in a limited number of soil samples at concentrations that exceeded the TBCs. Detectable levels of PBBs were found in nine out of 23 surface soil samples and one out of eight subsurface soil samples, but below the NJDEP NRDCSCC and the USEPA Region 3 non-residential SSL. Detectable levels of dioxins were found in the surface soil samples; however, none of the concentrations exceeded the TBCs. Although soil contamination (both organic and inorganic) was found at depths up to 12 feet, the majority of the contamination is present at the surface (i.e., in the top two feet).

Surface soil VOC contamination is present throughout the Site while subsurface contamination is primarily limited to the eastern/northeastern Site boundary. The majority of the VOCs are chlorinated compounds (e.g., tetrachloroethene) or benzene and its derivatives. Surface soil SVOC contamination is located on the northern, southeastern, and center portions of the property while subsurface contamination is limited to the center of the Site. Nearly all of the SVOCs detected are PAHs (e.g., benzo(a)pyrene). Surface and subsurface soil metal and surface soil PBB contamination is distributed throughout the Site. Pesticide/PCB contamination is primarily limited to the eastern portion of the Site.

6.1.2 Sump Sediment

Two sump sediment samples, one from a floor drain and a second from a sump, were collected from the Site buildings. Analysis of these samples indicated the presence of VOCs (mainly chlorinated compounds), SVOCs (mainly PAHs), pesticides, and metals at concentrations that exceeded the USEPA SSLs and/or NJDEP SCCs. In addition, one TCLP

VOC concentration exceeded the RCRA regulatory limit. PBBs were also detected; however, there are no federal or state ARARs/TBCs for this class of compound. VOC concentrations measured in the sump (Building No. 34) are sufficiently high to indicate that free-phase product may have accumulated in the sump. Residual contamination may exist around and under this sump.

6.1.3 Groundwater

Four rounds of synoptic water level measurements indicate that shallow groundwater flow is radial from a mound that exists in the vicinity of Building No. 34, thereby, creating a groundwater divide across the center portion of the Site. Mounding of groundwater in the vicinity of Building No. 34 may be caused by the flooded tunnel that exists under this building. North of the divide, groundwater flows in an easterly direction; south of the divide groundwater flows more uniformly to the south. The groundwater divide is less evident at depth. The direction of deeper groundwater flow is fairly consistent with the shallow groundwater flow and follows the surface of the underlying bedrock. In the southern portions of the Site, the main component of groundwater flow at depth is to the south, with groundwater flow in the northern portion of the Site varying from northeasterly to southeasterly. Synoptic water level measurements in the four pairs of shallow and deep wells (MW-1S/1D, MW-3S/3D, MW-5S/5D and MW-7S/7D) also indicate a downward vertical gradient across the Site.

Analysis of two rounds of groundwater samples indicated the presence of a variety of organic and inorganic contaminants, however, only chlorinated VOCs, inorganics, and several water quality parameters were found at concentrations that exceeded the USEPA MCL and/or NJDEP GQS. Every well contained VOCs at concentrations that exceeded the ARARs. The source(s) of the contamination in groundwater has not been definitively identified. The concentration of several VOCs in the groundwater are higher than those same constituents in soil.

The direction of deep groundwater flow from the monitoring wells along the southern and eastern Site boundaries is consistently in an off-Site direction. It appears, therefore, that the full horizontal and vertical extent of groundwater contamination is undefined.

A comparison of the concentration gradient of 1,2-dichloroethane reflects an increasing concentration gradient with depth that is sufficiently high to indicate the presence of DNAPL. It is likely, therefore, that DNAPL is present at the Site and has migrated at least to the top of the weathered bedrock. Monitoring of the groundwater in bedrock was beyond the scope of this RI, however, it is also possible that DNAPL has migrated into the bedrock.

6.1.4 Building Materials

Asbestos (both friable and non-friable) was found in all of the Site buildings except the Decon Shed and Pump House. The majority of the asbestos was materials associated with insulation, flooring, and roofing. The remaining asbestos was from laboratory related furnishings, caulkings, and miscellaneous debris.

Lead-based paint was detected in Building Nos. 33, 34, 35, 36, the Boiler Room, and the Pump House. With the exception of a wooden door casing, lead-based paint was found

on steel or other metal substrates such as columns, beams, railings, windows, doors, stairs, ladders, a wall, an elevator, and a fire escape.

One TCLP VOC (1,2-dichloroethane) was detected in a building material sample at a concentration that exceeded the RCRA TCLP regulatory limit. This sample was collected from the exterior of Building No. 33.

Wipe samples were collected from three buildings; Building Nos. 33, 34, and 35. Analysis of these samples indicated the presence of 24 SVOCs, eight pesticides, PBBs, and 21 metals. These results cannot be compared to any standards since there are no federal or state ARARs/TBCs for wipe samples.

6.2 FATE AND TRANSPORT

There are numerous site and chemical specific factors that determine the fate (i.e., transport and transformation) of contaminants in the environment. Site-specific factors include soil characteristics (TOC, CEC, pH, and soil particle size), hydraulic gradient, and cover material. Chemical-specific factors could include water solubility, the partition coefficients (K_{oc} and K_{ow}), and vapor pressure. Transport and transformation processes that could be affected by both Site and chemical specific factors include advection, dispersion, attenuation onto soils, facilitated transport (cosolvation and particle transport), volatilization, complexation, biodegradation, biotransformation, bioactivation, oxidation-reduction (redox) reactions, and precipitation.

VOCs, SVOCs, pesticides/PCBs, metals, and PBBs were all detected in soil at the Site. Generally, VOCs tend to migrate to the groundwater rather than sorb to the soil. At this Site, migration of VOCs from the soil to the groundwater does appear to be significant. This is likely due to their chemical properties, the high percentage of sand in the Site soil, and the presence of high concentrations of VOCs in the soil. SVOCs, in particular PAHs, are more likely to be sorbed to the organic matter in soil than migrating down the soil column, although minimal migration could occur. At this Site, migration of SVOCs from soils to the groundwater is not significant. Pesticides/PCBs are also unlikely to migrate from the soil to the groundwater at significant concentrations. Pesticide/PCBs were detected in several surface soil samples at the Site; however, only trace amounts were detected in the subsurface soil and groundwater samples. This indicates that migration of these chemicals at the Site is minimal. Chemically, PBBs are very similar to PCBs. PBBs were detected at the Site in several surface soil samples; however, they were only detected in one subsurface soil sample. In addition, only trace amounts were detected in the groundwater samples, indicating that mobility of PBBs down the soil column and into the groundwater is extremely limited.

Heavy metals in soil are subject to a variety of transport and transformation processes. In general, heavy metals introduced into soil will be affected by these processes until an equilibrium condition is achieved. However, as soil conditions change the equilibrium may change, resulting in the further migration of inorganics through the soils and into the groundwater. At the Site, heavy metals were detected in nearly all of the surface soil samples and approximately half of the subsurface soil samples at concentrations exceeding the TBCs and Site-specific background. Several metals were also found in the filtered and

unfiltered groundwater samples at concentrations exceeding the ARARs. In most cases, the metal concentrations detected in the unfiltered groundwater samples were much higher than the concentrations detected in the filtered groundwater samples. This indicates that many of the inorganics in groundwater are sorbed to soil particulates.

6.3 RECOMMENDATIONS

Additional investigations to fill data gaps are recommended. Data gaps identified based on the RI data include the following:

- Define the horizontal and vertical limits of groundwater contamination.
- Confirm the shallow groundwater flow direction and the potential influence of the flooded underground tunnel near Building No. 34.
- Investigate the potential for DNAPL in the soil and bedrock.
- Investigate potential source areas in the unsaturated soils.

These data gaps will be addressed by the USEPA in the predesign phase of the project.

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8.0 GLOSSARY OF ABBREVIATIONS AND ACRONYMS

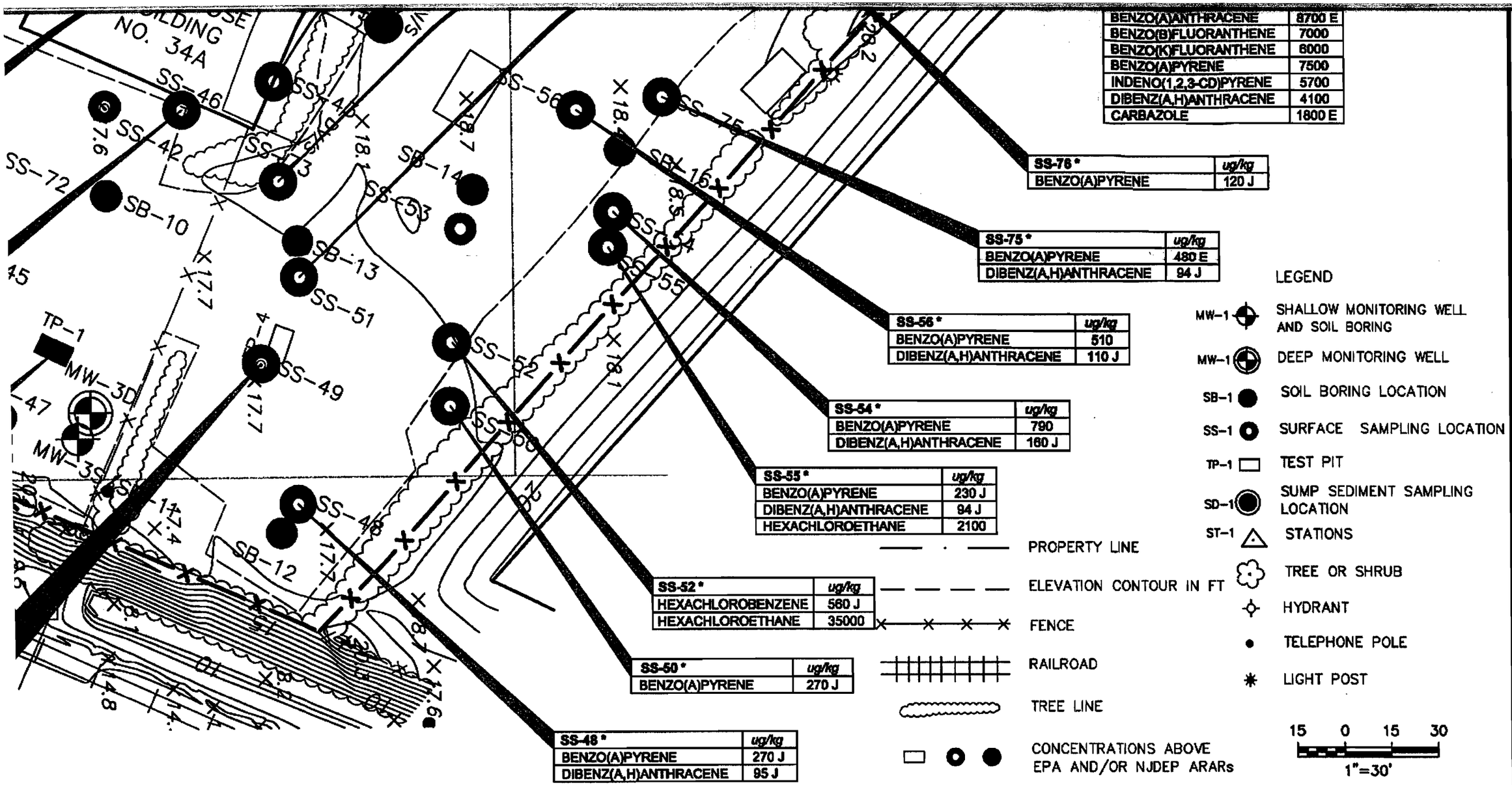
ACM	Asbestos Containing Material
AHERA	Asbestos Hazard Emergency Response Act
Al	Aluminum
ARAR	Applicable or Relevant and Appropriate Requirement
ARCS	Alternative Remedial Contracting Strategy
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
B.P.	Before Present
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
BWA	Bureau of Water Allocation
C	Celsius
ca	Circa
CDD	Chlorinated Dibenzo-p-dioxin
CEC	Cation Exchange Capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
cm	Centimeter
CN	Cyanide
CRDL	Contract Required Detection Limit

CRQL	Contract Required Quantification Limit
CSC	Central Services Corporation
DAF	Dilution-Attenuation Factor
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
DQO	Data Quality Objective
DTW	Depth to Water
E	Estimated Laboratory Data
ECRA	Environmental Cleanup Responsibility Act
Eh	Redox Potential
EHS	Extremely Hazardous Substance
EM	Electromagnetic Induction
ERT	Environmental Response Team
F	Fahrenheit
FAC	Facultative Species
FACU	Facultative Upland Species
FACW	Facultative Wetland Species
FS	Feasibility Study
FSP	Field Sampling Plan
FSS	Focussed Feasibility Study
ft	Foot
FWENC	Foster Wheeler Environmental Corporation
GIS	Geographic Information System
gpm	Gallons per Minute

GQC	Groundwater Quality Criteria
GPR	Ground Penetrating Radar
GPS	Global Positioning System
H	Henry's Law Constant
Hg	Mercury
HOC	Hydrophobic Organic Compound
HpCDD	Heptachlorodibenzo-p-dioxin
HRGC	High Resolution Gas Chromatography
HUD	Department of Housing and Urban Development
HxCDD	Hexachlorodibenzo-p-dioxin
IDL	Instrument Detection Limit
K_{OC}	Organic Carbon Partition Coefficient
K_{OW}	Octanol/Water Partitioning Coefficient
L1OW	Lacustrine, Limnetic, Open Water
LRMS	Low Resolution Mass Spectrometry
MCL	Maximum Contaminant Level
MEK	2-Hexanone
Mg	Magnesium
mg/kg	Milligrams per Kilogram
MHz	Megahertz
MIBK	4-Methyl-2-Pentanone
min	Minute
ml	Milliliter

mm	Millimeters
MSL	Mean Sea Level
N	Presumptive Evidence of Compound
NAD	North American Datum
ng/g	Nanograms per Gram
ng/L	Nanograms per Liter
ng/kg	Nanogram per Kilogram
NGVD	National Geodetic Vertical Datum
NHP	Natural Heritage Program
NJ	New Jersey
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJPDES	New Jersey Pollution Discharge Elimination System
non-RAS	Non-Routine Analytical Services
NOV	Notice of Violation
NPL	National Priorities List
NRDCSCC	Non-Residential Direct Contact Soil Cleanup Criteria
NTP	National Toxicology Program
NTU	Nephelometric Turbidity Unit
NWI	National Wetland Inventory
OBL	Obligate Wetland Species
ORP	Oxygen Reduction Potential
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PBB	Polybrominated Biphenyl

PCB	Polychlorinated Biphenyl
PeCDD	Pentachlorodibenzo-p-dioxin
PID	Photoionization Detector
PLM	Polarized Light Microscopy
ppm	Parts per Million
ppt	Parts per Trillion
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
QAPjP	Quality Assurance Project Plan
R	Rejected Laboratory Data
RAC	Remedial Action Contract
RAS	Routine Analytical Services
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SCC	Soil Cleanup Criteria
sec	Second
SG	Specific Gravity
SIU	Significant Industrial Usage
SOW	Statement of Work
SPCC	Spill Prevention, Compensation and Control Act



SVOCs ABOVE USEPA AND/OR NJDEP TBCs IN SURFACE SOIL

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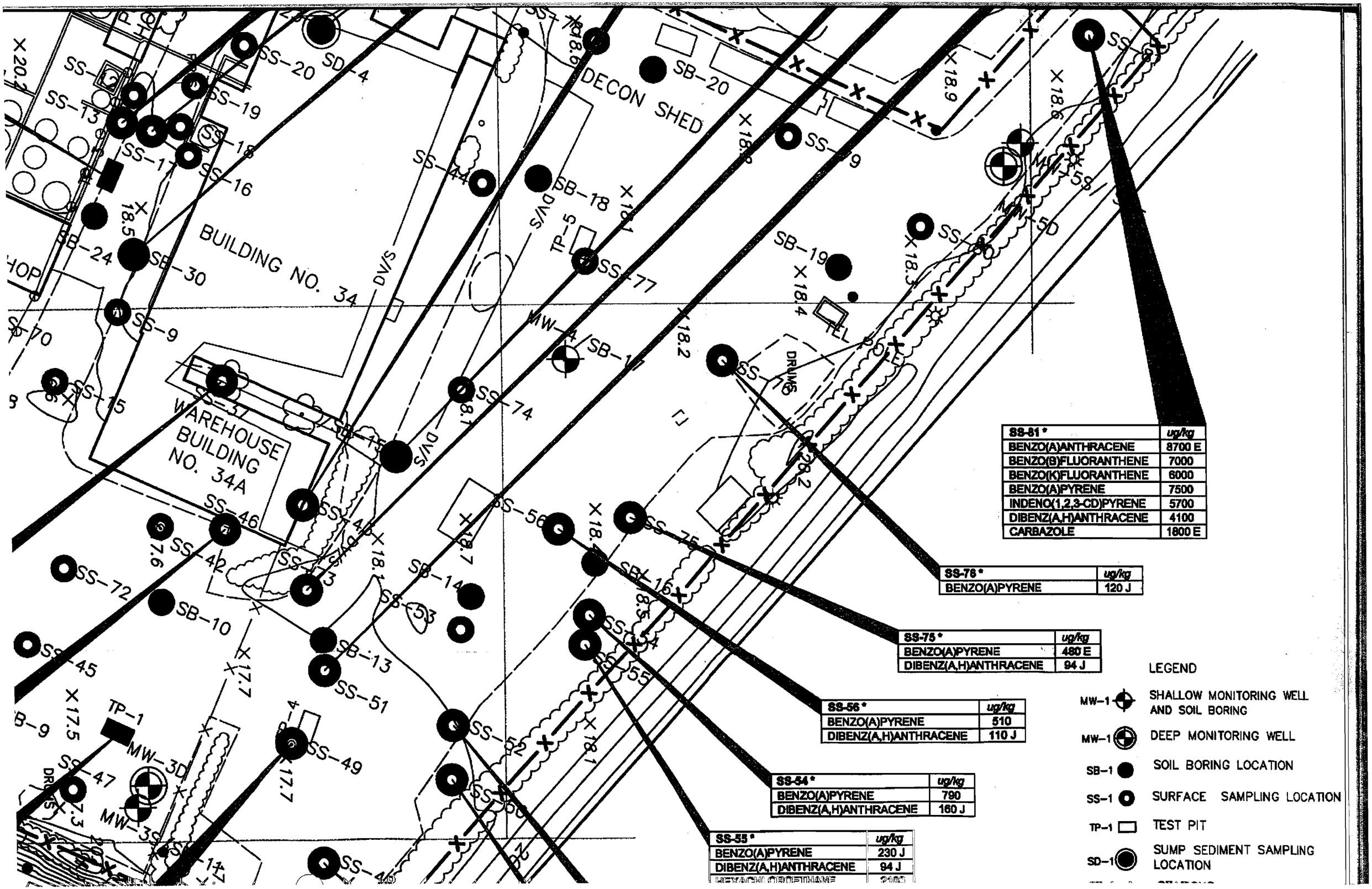
PLATE 4



SS-81 *	ug/kg
BENZO(A)ANTHRACENE	8700 E
BENZO(B)FLUORANTHENE	7000
BENZO(K)FLUORANTHENE	6000
BENZO(A)PYRENE	7500
INDENO(1,2,3-CD)PYRENE	5700
DIBENZ(A,H)ANTHRACENE	4100
CARBAZOLE	1800 E

SS-78 *	ug/kg
BENZO(A)PYRENE	120 J

SS-75 *	ug/kg
BENZO(A)PYRENE	480 E
DIBENZ(A,H)ANTHRACENE	94 J

SS-56 *	ug/kg
BENZO(A)PYRENE	510
DIBENZ(A,H)ANTHRACENE	110 J

SS-54 *	ug/kg
BENZO(A)PYRENE	790
DIBENZ(A,H)ANTHRACENE	160 J

SS-55 *	ug/kg
BENZO(A)PYRENE	230 J
DIBENZ(A,H)ANTHRACENE	94 J

SB-28	ug/kg
BENZO(A)ANTHRACENE	1100 E
BENZO(A)PYRENE	760 J
DIBENZ(A,H)ANTHRACENE	180 J

SS-84	ug/kg
BENZO(A)PYRENE	200 J

SD-1	ug/kg
BENZO(A)ANTHRACENE	220 J
BENZO(B)FLUORANTHENE	1400 E
BENZO(A)PYRENE	860 E

SS-03 *	ug/kg
BENZO(A)PYRENE	320 J

SB-23 *	ug/kg
BENZO(A)PYRENE	1900 E
INDENO(1,2,3-CD)PYRENE	1500 E
DIBENZ(A,H)ANTHRACENE	240 J

SS-13 *	ug/kg
BENZO(A)PYRENE	100 J

SS-17 *	ug/kg
BENZO(A)PYRENE	180 J

SD-4	ug/kg
BENZO(A)ANTHRACENE	3000 J
BENZO(B)FLUORANTHENE	2800 J
BENZO(A)PYRENE	2900 J
HEXACHLOROETHANE	4700 J
CARBAZOLE	1300 J

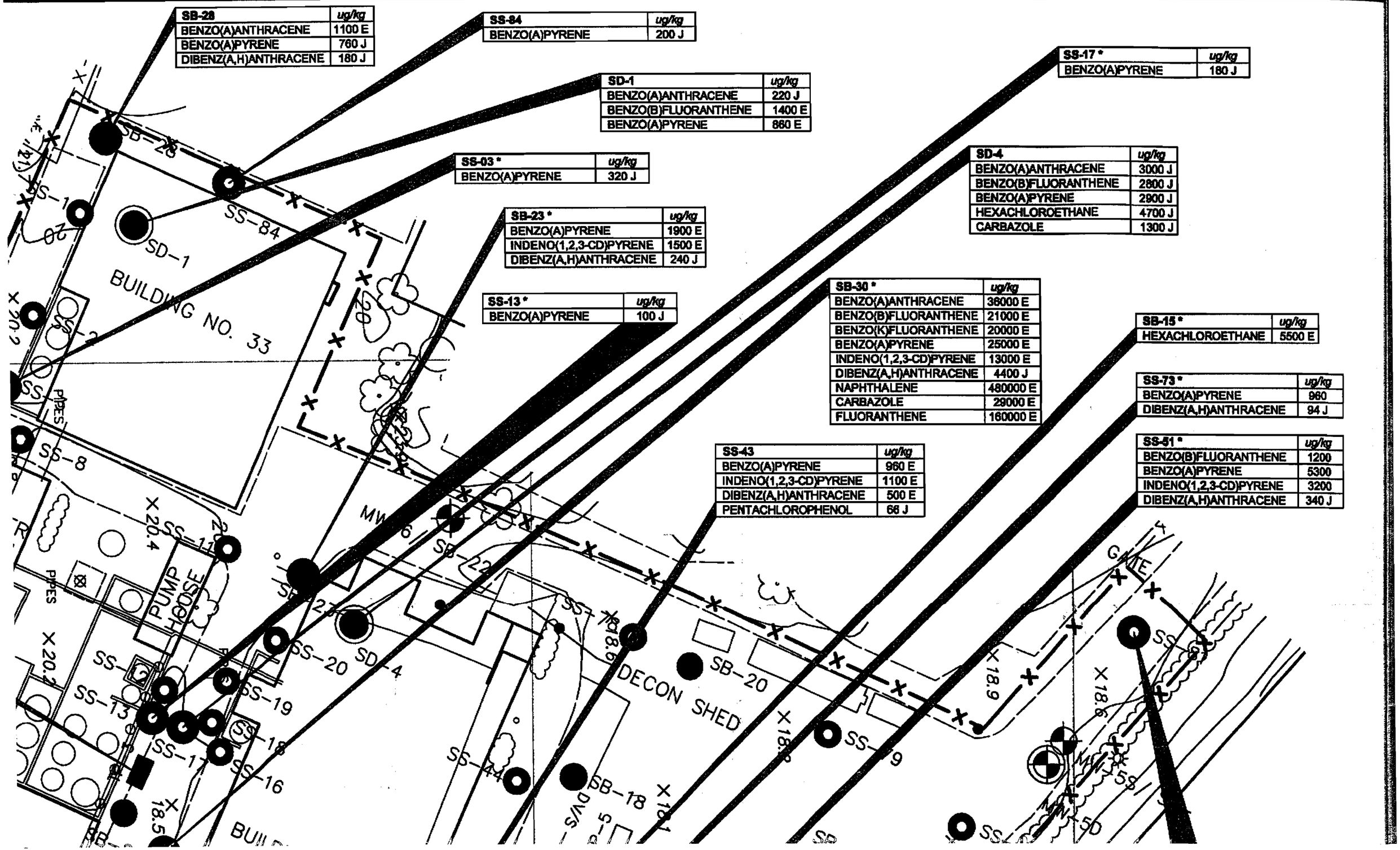
SB-30 *	ug/kg
BENZO(A)ANTHRACENE	36000 E
BENZO(B)FLUORANTHENE	21000 E
BENZO(K)FLUORANTHENE	20000 E
BENZO(A)PYRENE	25000 E
INDENO(1,2,3-CD)PYRENE	13000 E
DIBENZ(A,H)ANTHRACENE	4400 J
NAPHTHALENE	480000 E
CARBAZOLE	29000 E
FLUORANTHENE	160000 E

SB-15 *	ug/kg
HEXACHLOROETHANE	5500 E

SS-73 *	ug/kg
BENZO(A)PYRENE	960
DIBENZ(A,H)ANTHRACENE	94 J

SS-43	ug/kg
BENZO(A)PYRENE	960 E
INDENO(1,2,3-CD)PYRENE	1100 E
DIBENZ(A,H)ANTHRACENE	500 E
PENTACHLOROPHENOL	66 J

SS-51 *	ug/kg
BENZO(B)FLUORANTHENE	1200
BENZO(A)PYRENE	5300
INDENO(1,2,3-CD)PYRENE	3200
DIBENZ(A,H)ANTHRACENE	340 J



BENZO(A)ANTHRACENE	1300 J
BENZO(B)FLUORANTHENE	1500 J
BENZO(A)PYRENE	1500 J
INDENO(1,2,3-CD)PYRENE	1200 J

SB-01 *	ug/kg
BENZO(A)PYRENE	110 J

SS-63 *	ug/kg
BENZO(A)ANTHRACENE	7700 J
BENZO(B)FLUORANTHENE	6800 J
BENZO(K)FLUORANTHENE	5500 J
BENZO(A)PYRENE	6500 J
INDENO(1,2,3-CD)PYRENE	4100 J
DIBENZ(A,H)ANTHRACENE	1900 J
CARBAZOLE	1300 J

SS-83 *	ug/kg
BENZO(A)PYRENE	110 J

SS-28 *	ug/kg
BENZO(A)PYRENE	180 J
DIBENZ(A,H)ANTHRACENE	100 J

SS-82	ug/kg
PENTACHLOROPHENOL	110 J

SB-08	ug/kg
BENZO(A)PYRENE	140 J

TP-02	ug/kg
BENZO(A)PYRENE	400
PENTACHLOROPHENOL	71 J

SS-37	ug/kg
BENZO(A)PYRENE	220 J

SS-46	ug/kg
BENZO(A)PYRENE	440 E

TP-01 *	ug/kg
BENZO(A)PYRENE	140 J

SS-49 *	
BENZO(A)PYRENE	
DIBENZ(A,H)ANTHRACENE	

NOTES:

1. * THIS INDICATES THAT THE SAMPLE WAS COLLECTED BELOW ASPHALT AND ROAD BED.
2. ALL SURFACE SOIL SAMPLES WERE COLLECTED TO A DEPTH OF 2 FEET OR LESS; THIS DEPTH DOES NOT TAKE INTO ACCOUNT ANY OVERLYING IMPERMEABLE MATERIAL (i.e., ASPHALT AND ROAD BED).

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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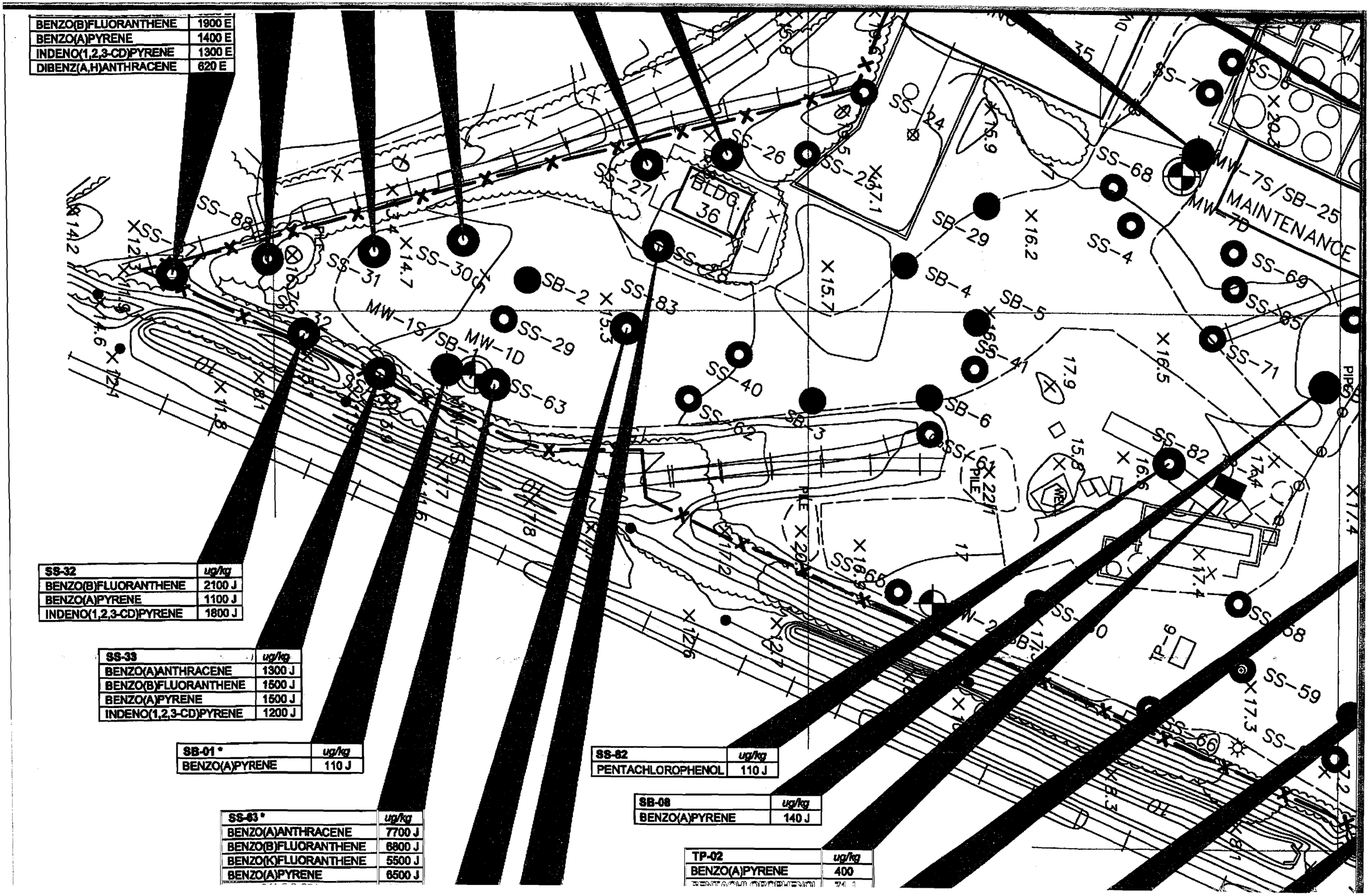
NEWARK, NEW JERSEY
USEPA RAC II PROGRAM
CONTRACT NO. 68-W-98-214; W.A. NO. 027-RI



BENZO(B)FLUORANTHENE	1900 E
BENZO(A)PYRENE	1400 E
INDENO(1,2,3-CD)PYRENE	1300 E
DIBENZ(A,H)ANTHRACENE	620 E

SS-32	ug/kg
BENZO(B)FLUORANTHENE	2100 J
BENZO(A)PYRENE	1100 J
INDENO(1,2,3-CD)PYRENE	1800 J

SS-33	ug/kg
BENZO(A)ANTHRACENE	1300 J
BENZO(B)FLUORANTHENE	1500 J
BENZO(A)PYRENE	1500 J
INDENO(1,2,3-CD)PYRENE	1200 J

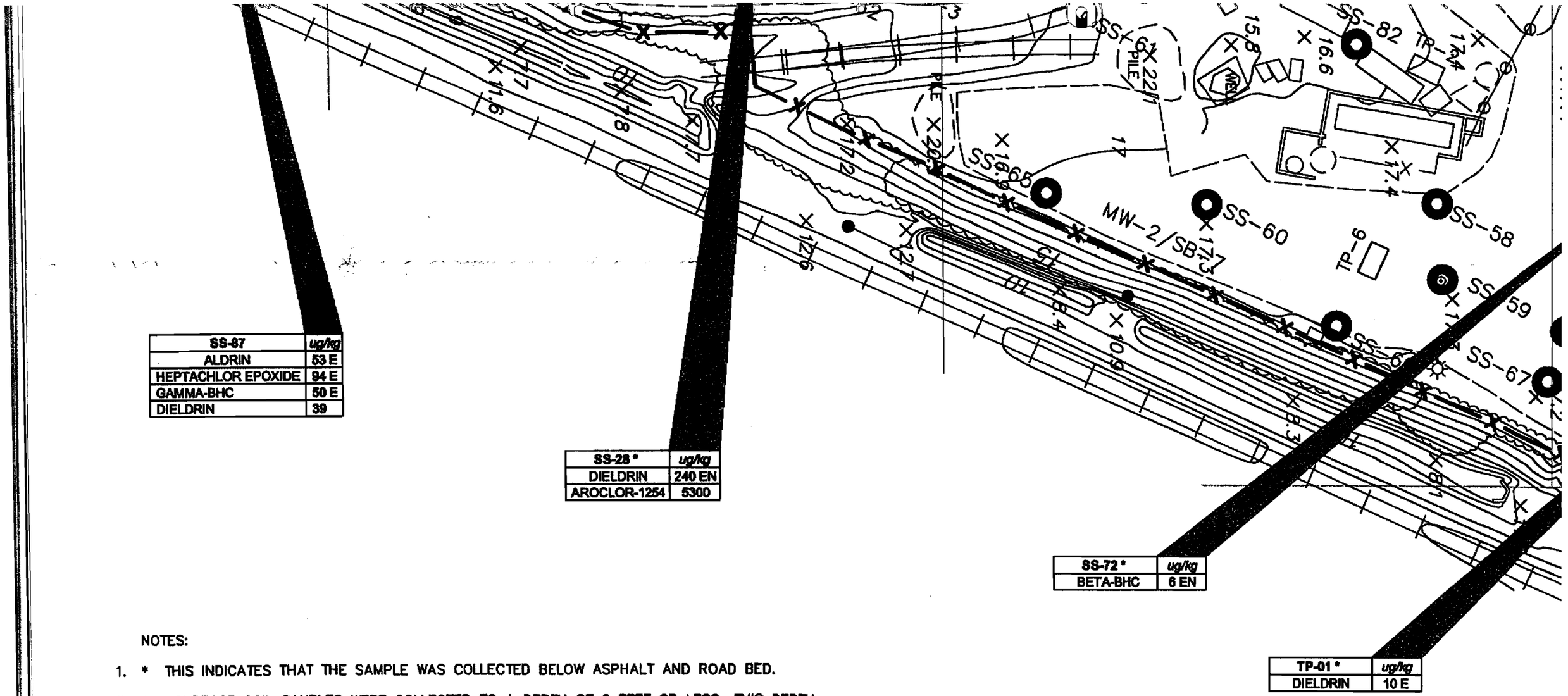
SB-01 *	ug/kg
BENZO(A)PYRENE	110 J

SS-63 *	ug/kg
BENZO(A)ANTHRACENE	7700 J
BENZO(B)FLUORANTHENE	6800 J
BENZO(K)FLUORANTHENE	5500 J
BENZO(A)PYRENE	6500 J

SS-82	ug/kg
PENTACHLOROPHENOL	110 J

SB-08	ug/kg
BENZO(A)PYRENE	140 J

TP-02	ug/kg
BENZO(A)PYRENE	400
PENTACHLOROPHENOL	71 J



SS-87	ug/kg
ALDRIN	53 E
HEPTACHLOR EPOXIDE	94 E
GAMMA-BHC	50 E
DIELDRIN	39

SS-28 *	ug/kg
DIELDRIN	240 EN
AROCLOR-1254	5300

NOTES:

1. * THIS INDICATES THAT THE SAMPLE WAS COLLECTED BELOW ASPHALT AND ROAD BED.
2. ALL SURFACE SOIL SAMPLES WERE COLLECTED TO A DEPTH OF 2 FEET OR LESS; THIS DEPTH DOES NOT TAKE INTO ACCOUNT ANY OVERLYING IMPERMEABLE MATERIAL (i.e., ASPHALT AND ROAD BED).

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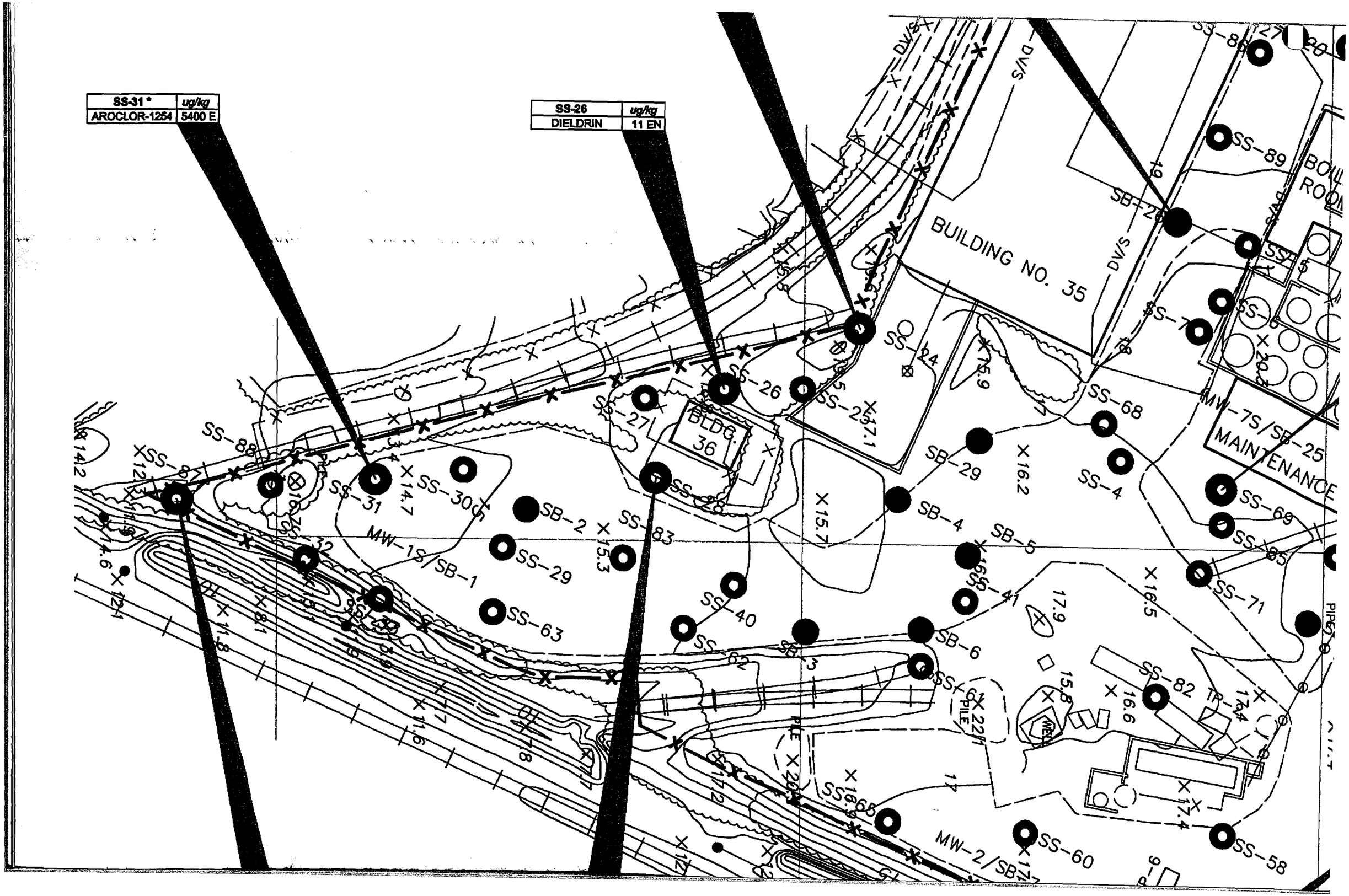
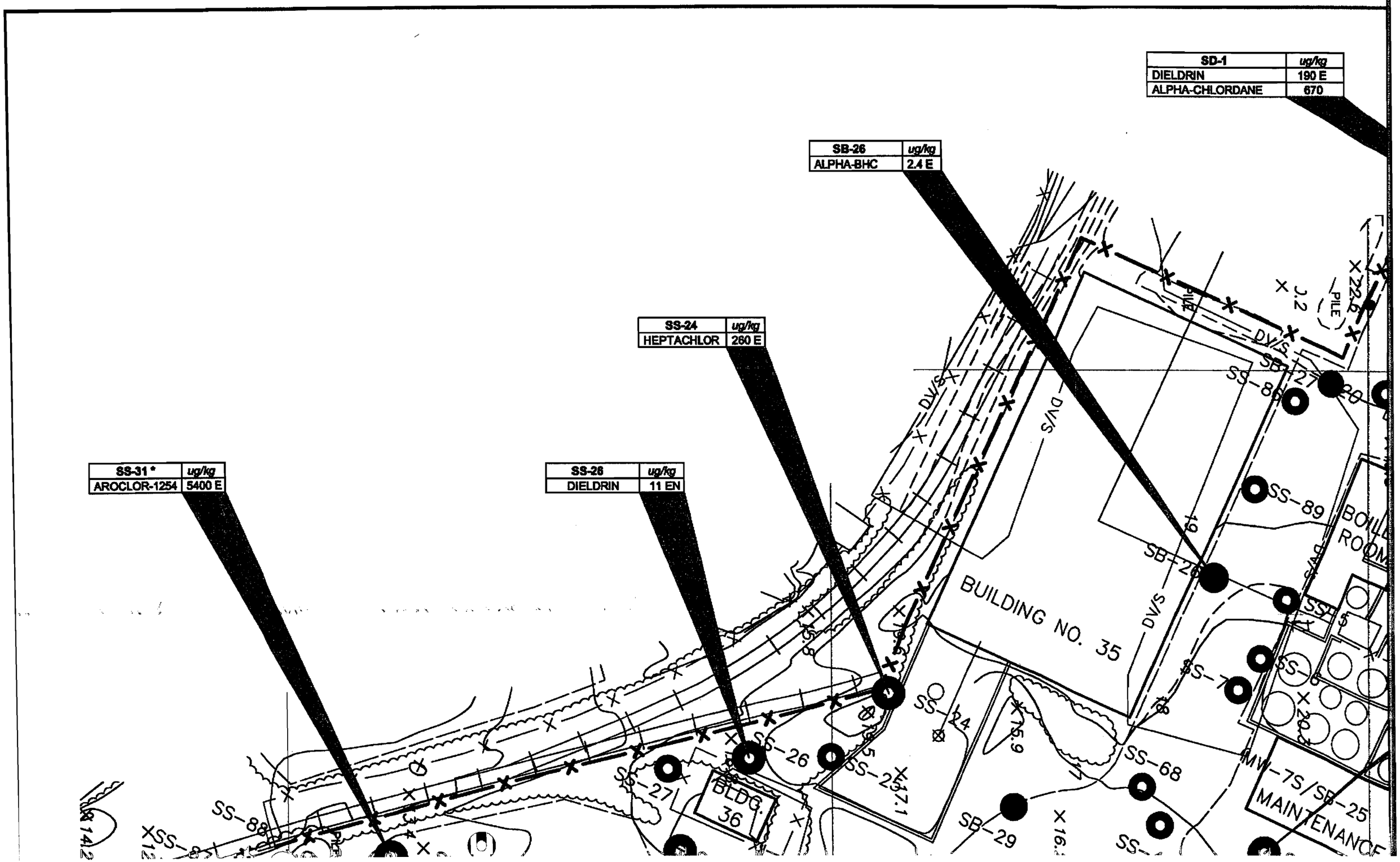


SS-31 * | ug/kg
AROCLOR-1254 | 5400 E
SS-26 | ug/kg
DIELDRIN | 11 EN
BUILDING NO. 35
BLDG. 36
MAINTENANCE
MW-1S/SB-1
MW-2/SB
MW-7S/SB-25
SS-88
SS-87
SS-31
SS-30
SS-32
SS-29
SS-63
SS-83
SS-27
SS-26
SS-25
SS-24
SS-28
SS-40
SS-62
SS-61
SS-60
SS-58
SS-82
SS-71
SS-69
SS-85
SS-4
SS-68
SS-89
SB-2
SB-3
SB-4
SB-5
SB-6
SB-29
SB-26
DV/S
PILE



SD-1 | ug/kg
DIELDRIN | 190 E
ALPHA-CHLORDANE | 670
SB-26 | ug/kg
ALPHA-BHC | 2.4 E
SS-24 | ug/kg
HEPTACHLOR | 260 E
SS-31 * | ug/kg
AROCLOR-1254 | 5400 E
SS-26 | ug/kg
DIELDRIN | 11 EN
BUILDING NO. 35
BLDG. 36
MW-7S/SB-25
MAINTENANCE
SS-88
SS-27
SS-26
SS-25
SS-24
SB-29
SS-68
SS-89
SB-26
SS-7
SS-86
SB-27
DV/S
PILE

SITE

CO–026J

PESICIDES/PCB ABOVE USEPA AND/OR NJDEP TBCs IN SURFACE AND SUB-SURFACESOIL

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PLATE 5

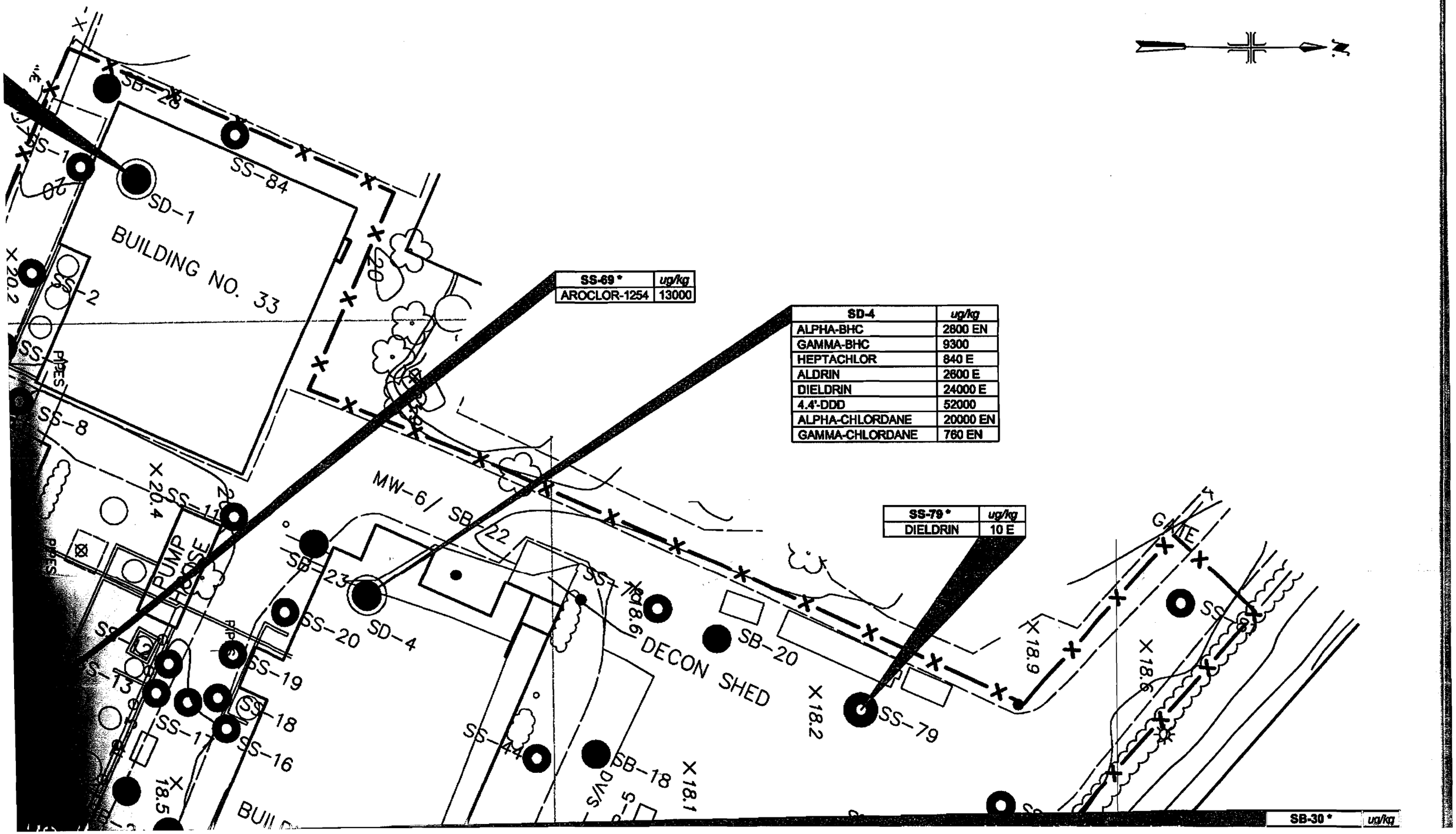
ALPHA-BHC	2800 EN
GAMMA-BHC	9300
HEPTACHLOR	840 E
ALDRIN	2600 E
DIELDRIN	24000 E
4,4'-DDD	52000
ALPHA-CHLORDANE	20000 EN
GAMMA-CHLORDANE	760 EN

SS-79 *	ug/kg
DIELDRIN	10 E

SB-30 *	ug/kg
SAMPLE DEPTH	3'-5'
DIELDRIN	8 E

SS-43	ug/kg
HEPTACHLOR	400 E
ALDRIN	160 E

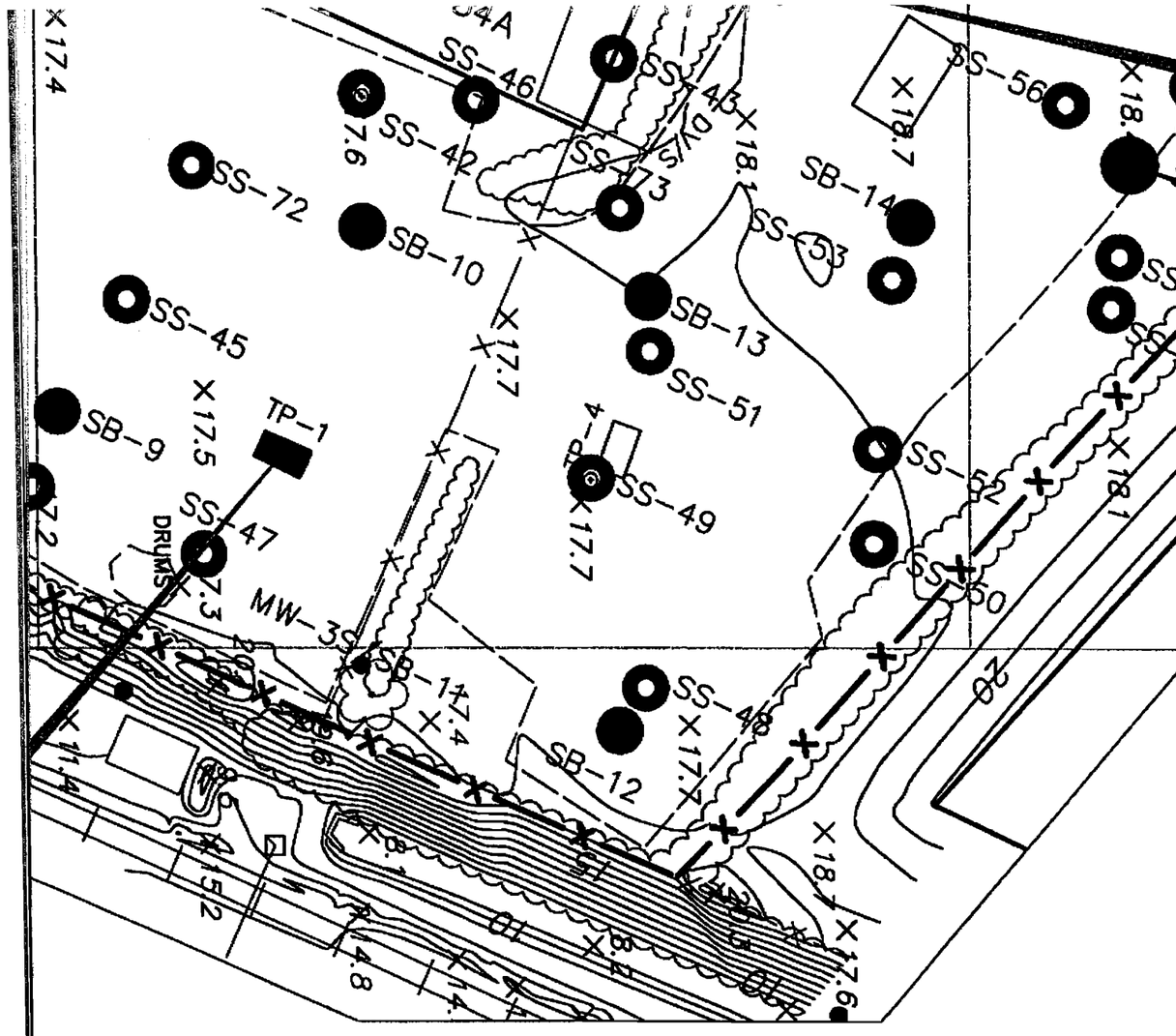
SS-52 *	ug/kg
4,4'-DDD	18000



SS-69 *	ug/kg
AROCLOR-1254	13000

SD-4	ug/kg
ALPHA-BHC	2800 EN
GAMMA-BHC	9300
HEPTACHLOR	840 E
ALDRIN	2600 E
DIELDRIN	24000 E
4.4'-DDD	52000
ALPHA-CHLORDANE	20000 EN
GAMMA-CHLORDANE	760 EN

SS-79 *	ug/kg
DIELDRIN	10 E



SURFACE SOIL

SS-37	ng/g
POLYBROMINATED BIPHENYLS (PBBs)	1.1

SURFACE SOIL

SB-15 **	ug/g
TCLP: TRICHLOROETHENE	580

SURFACE SOIL

SB-16 **	ng/g
POLYBROMINATED BIPHENYLS (PBBs)	0.28

LEGEND

- MW-1 — SHALLOW MONITORING WELL AND SOIL BORING
- MW-1 — DEEP MONITORING WELL
- SB-1 — SOIL BORING LOCATION
- SS-1 — SURFACE SAMPLING LOCATION
- TP-1 — TEST PIT
- SD-1 — SUMP SEDIMENT SAMPLING LOCATION
- ST-1 — STATIONS
- TREE OR SHRUB
- HYDRANT
- TELEPHONE POLE
- LIGHT POST
- PROPERTY LINE
- ELEVATION CONTOUR IN FT
- FENCE (PROPERTY BOUNDARY
- FENCE
- RAILROAD
- TREE LINE
- CONCENTRATIONS ABOVE EPA AND/OR NJDEP ARARs

15 0 15 30

1"=30'

SITE

CO-026J

PBBs DETECTED AND TCLP PARAMETER CONCENTRATIONS ABOVE RCRA REGULATORY LIMITS IN SURFACE AND SUBSURFACE SOIL

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PLATE 6

SURFACE SOIL

TP-05 **	ng/g
POLYBROMINATED BIPHENYLS (PBBs)	0.43

SURFACE SOIL

SS-37	ng/g
POLYBROMINATED BIPHENYLS (PBBs)	1.1

SURFACE SOIL

SB-15 **	ug/g
TCLP: TRICHLOROETHENE	580

SURFACE SOIL

SD-4 ng/g
POLYBROMINATED BIPHENYLS (PBBs) 750
SURFACE SOIL
TP-05 ** ng/g
POLYBROMINATED BIPHENYLS (PBBs) 0.43
N
BUILDING NO. 33
SB-28
SS-84
SD-1
SS-2
SS-8
PIPES
PUMP HOUSE
SB-23
SD-4
SS-20
SS-19
SS-18
SS-17
SS-16
SS-13
SB-22
SS-79
SB-18
SB-19
TP-5
SB-24
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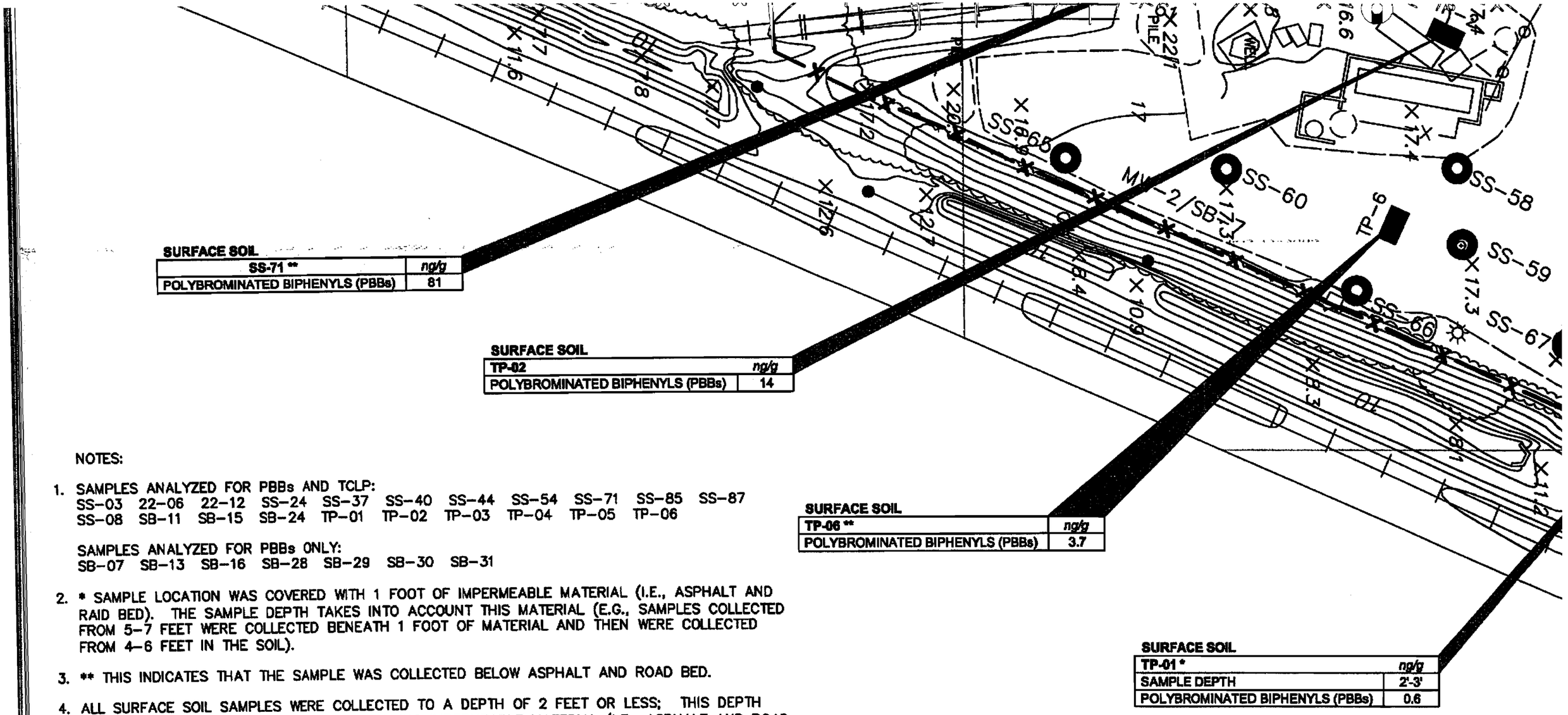
20.4
18.5
18.1
18.2
18.9
18.6



NOTES:

1. SAMPLES ANALYZED FOR PBBs AND TCLP:
   SS-03 22-06 22-12 SS-24 SS-37 SS-40 SS-44 SS-54 SS-71 SS-85 SS-87
   SS-08 SB-11 SB-15 SB-24 TP-01 TP-02 TP-03 TP-04 TP-05 TP-06

   SAMPLES ANALYZED FOR PBBs ONLY:
   SB-07 SB-13 SB-16 SB-28 SB-29 SB-30 SB-31

2. * SAMPLE LOCATION WAS COVERED WITH 1 FOOT OF IMPERMEABLE MATERIAL (I.E., ASPHALT AND RAID BED). THE SAMPLE DEPTH TAKES INTO ACCOUNT THIS MATERIAL (E.G., SAMPLES COLLECTED FROM 5-7 FEET WERE COLLECTED BENEATH 1 FOOT OF MATERIAL AND THEN WERE COLLECTED FROM 4-6 FEET IN THE SOIL).

3. ** THIS INDICATES THAT THE SAMPLE WAS COLLECTED BELOW ASPHALT AND ROAD BED.

4. ALL SURFACE SOIL SAMPLES WERE COLLECTED TO A DEPTH OF 2 FEET OR LESS; THIS DEPTH DOES NOT TAKE INTO ACCOUNT ANY OVERLYING IMPERMEABLE MATERIAL (I.E., ASPHALT AND ROAD BED.

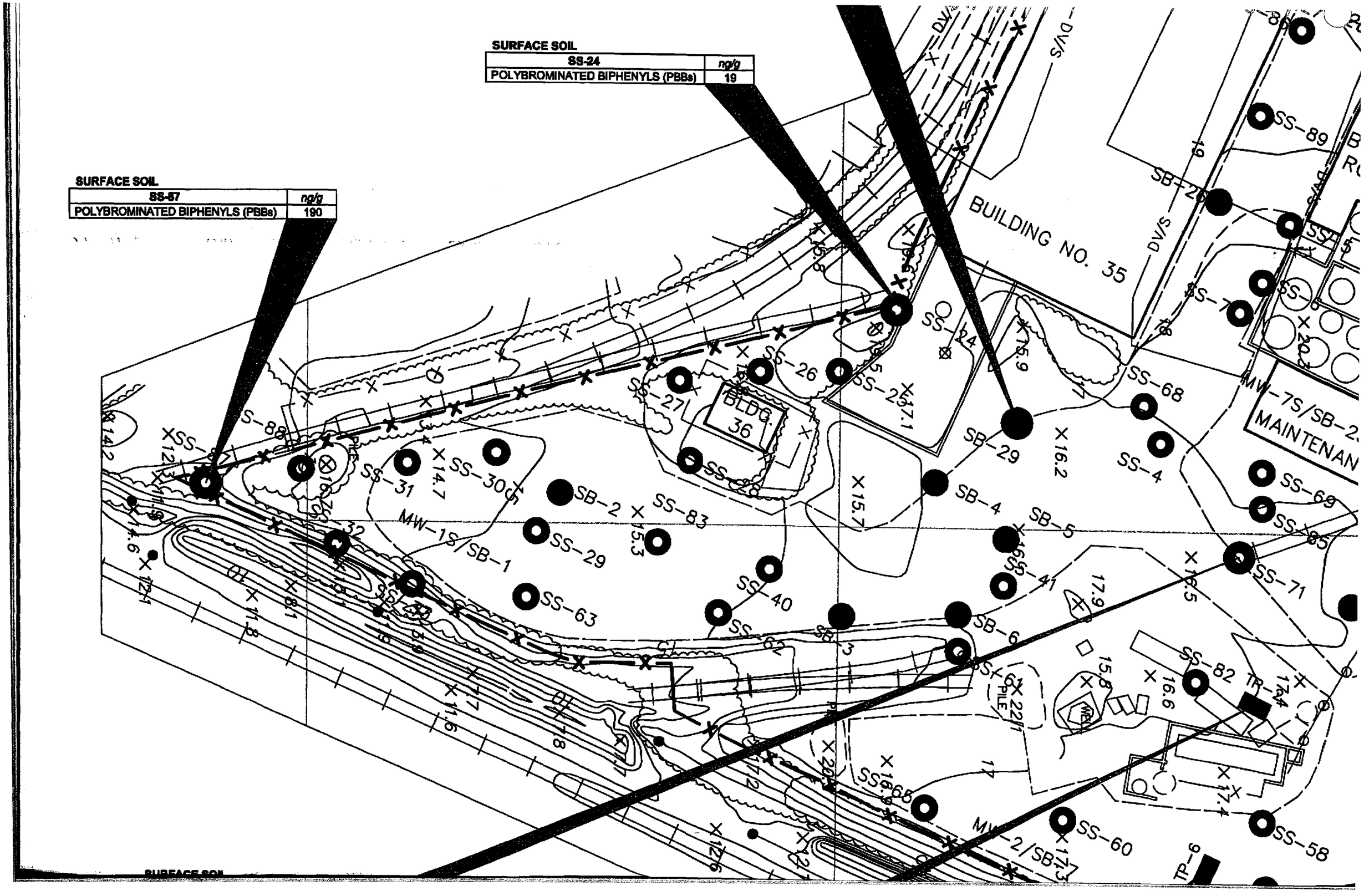
5. *** SAMPLE LOCATION WAS COVERED WITH 1.5 FEET OF FROZEN GROUND.

MALCOLM PIRNIE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

FW

WHITE CHEMICAL CORPORATION SUPERFUND
NEWARK, NEW JERSEY
USEPA RAC II PROGRAM
CONTRACT NO. 68-W-98-214; W.A. NO. 027-RI


SURFACE SOIL
SS-24 | ng/g
POLYBROMINATED BIPHENYLS (PBBs) | 19
SURFACE SOIL
SS-87 | ng/g
POLYBROMINATED BIPHENYLS (PBBs) | 190
BUILDING NO. 35
BLDG. 36
MAINTENAN
MW-1S/SB-1
MW-2/SB-7
MW-7S/SB-2
SS-24
SS-26
SS-27
SS-28
SS-29
SS-30
SS-31
SS-32
SS-40
SS-41
SS-58
SS-60
SS-62
SS-63
SS-68
SS-69
SS-71
SS-82
SS-83
SS-85
SS-88
SS-89
SB-2
SB-3
SB-4
SB-5
SB-6
SB-29
DV/S
PILE
TP-6
SURFACE SOIL

SD-1	ng/g
POLYBROMINATED BIPHENYLS (PBBs)	76 E

SUBSURFACE SOIL

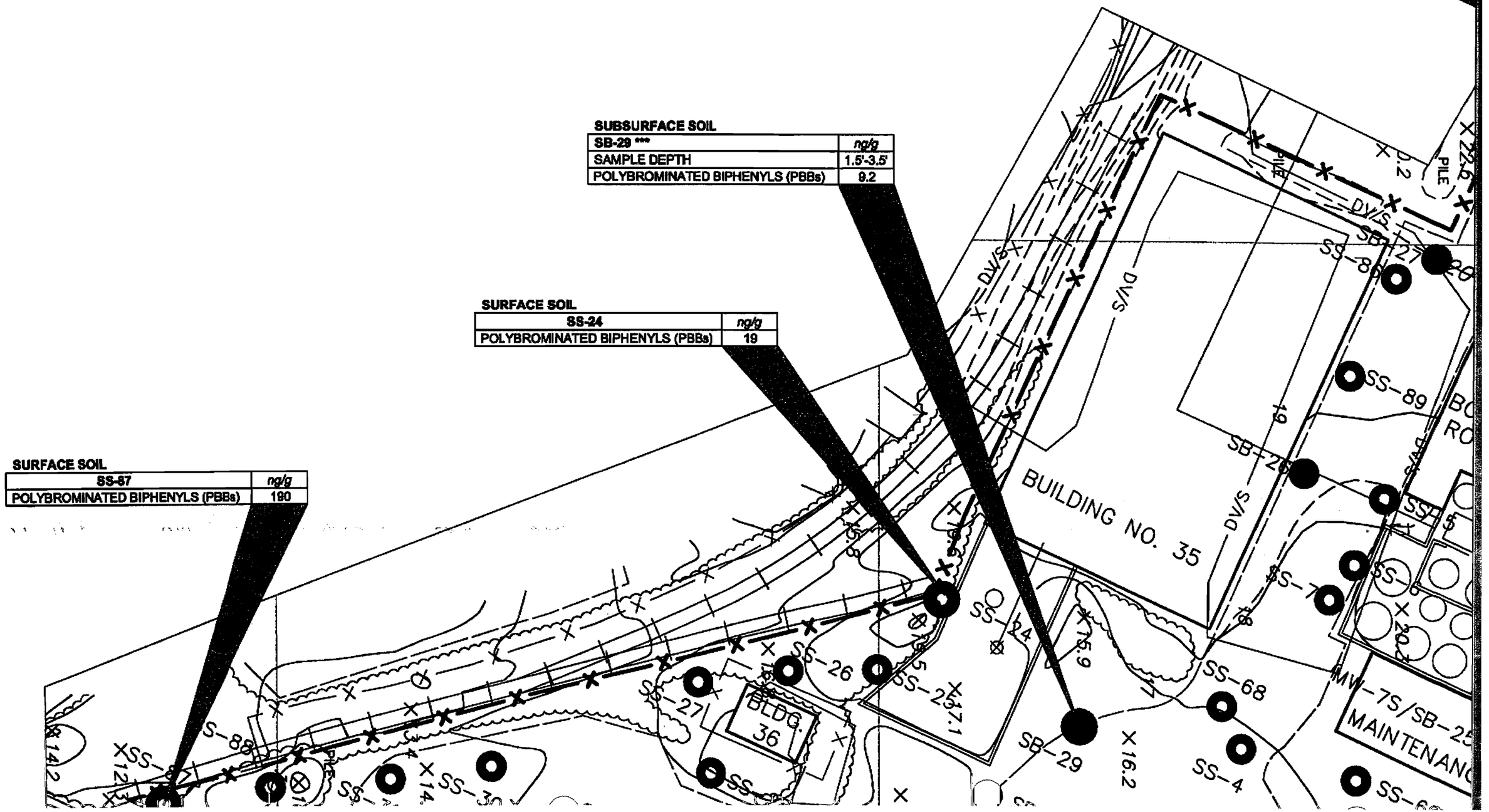
SB-29 ***	ng/g
SAMPLE DEPTH	1.5'-3.5'
POLYBROMINATED BIPHENYLS (PBBs)	9.2

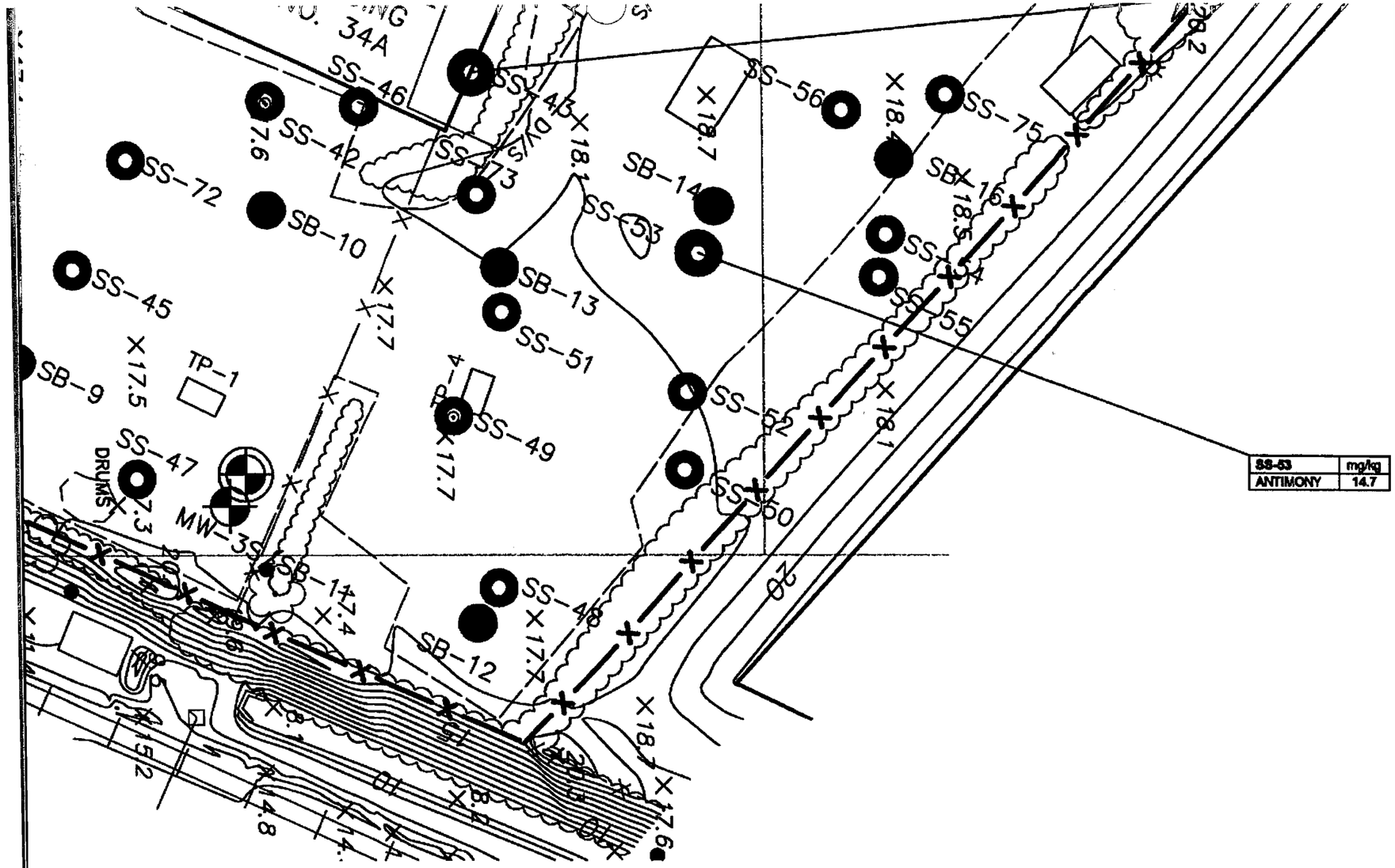
SURFACE SOIL

SS-24	ng/g
POLYBROMINATED BIPHENYLS (PBBs)	19

SURFACE SOIL

SS-67	ng/g
POLYBROMINATED BIPHENYLS (PBBs)	190





LEGEND

- MW-1 — SHALLOW MONITORING WELL AND SOIL BORING
- MW-1 — DEEP MONITORING WELL
- SB-1 — SOIL BORING LOCATION
- SS-1 — SURFACE SAMPLING LOCATION
- TP-1 — TEST PIT
- SD-1 — SUMP SEDIMENT SAMPLING LOCATION
- ST-1 — STATIONS
- TREE OR SHRUB
- HYDRANT
- TELEPHONE POLE
- LIGHT POST
- PROPERTY LINE
- ELEVATION CONTOUR IN FT
- FENCE (PROPERTY BOUNDARY)
- FENCE
- RAILROAD
- TREE LINE
- CONCENTRATIONS ABOVE EPA AND/OR NJDEP ARARs

15 0 15 30

1"=30'

SITE

CO-026J

INORGANICS ABOVE USEPA AND/OR NJDEP TBCs IN SURFACE SOIL

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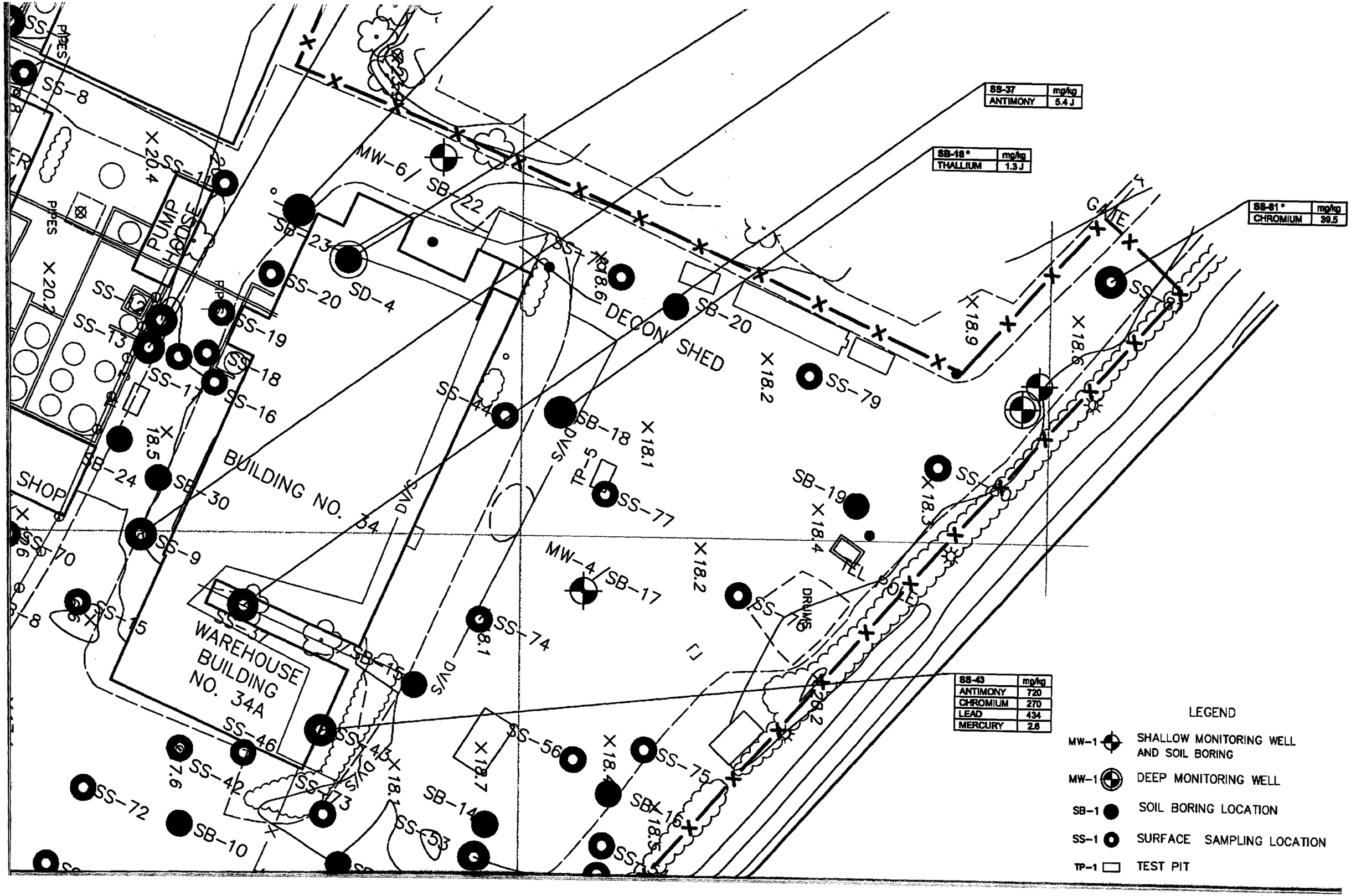
PLATE 7


SS-37 | mg/kg
ANTIMONY | 5.4 J
SB-18 * | mg/kg
THALLIUM | 1.3 J
SS-81 * | mg/kg
CHROMIUM | 39.5
SS-43 | mg/kg
ANTIMONY | 720
CHROMIUM | 270
LEAD | 434
MERCURY | 2.6
LEGEND
MW-1 SHALLOW MONITORING WELL AND SOIL BORING
MW-1 DEEP MONITORING WELL
SB-1 SOIL BORING LOCATION
SS-1 SURFACE SAMPLING LOCATION
TP-1 TEST PIT
PUMP HOUSE
SHOP
BUILDING NO. 54
WAREHOUSE BUILDING NO. 34A
DECON SHED
DRUMS
TEL POLE
GATE
PIPES
DVS
MW-6/SB-22
SB-23
SD-4
SB-20
SB-18
SB-24
SB-30
SB-9
SB-15
SB-17
SB-19
SB-14
SB-16
SB-10
TP-5
SS-8
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SS-1000

SB-28	mg/kg
ARSENIC	27.7
COPPER	3870
LEAD	642
NICKEL	198
ZINC	1980

SS-03 *	mg/kg
COPPER	736
THALLIUM	1.7 J

SS-12 *	mg/kg
THALLIUM	1.1 J

SS-13 *	mg/kg
THALLIUM	1.1 J

SB-23 *	mg/kg
THALLIUM	1 J

SD-4 *	mg/kg
ANTIMONY	1720

SS-09 *	mg/kg
COPPER	743 E

SS-37	mg/kg
ANTIMONY	5.4 J

SB-18 *	mg/kg
THALLIUM	1.3 J

SS-31 *	mg/kg
CHROMIUM	39.5

SB-28
SS-84
SD-1
BUILDING NO. 33
SS-2
SS-1
SS-8
PIPES
PUMP HOUSE
SS-14
SS-13
SS-17
SS-16
SS-18
SS-19
SS-20
SB-23
SD-4
MW-6 / SB-22
SS-7
SS-44
SB-18
DECON SHED
SB-20
SS-79
GATE
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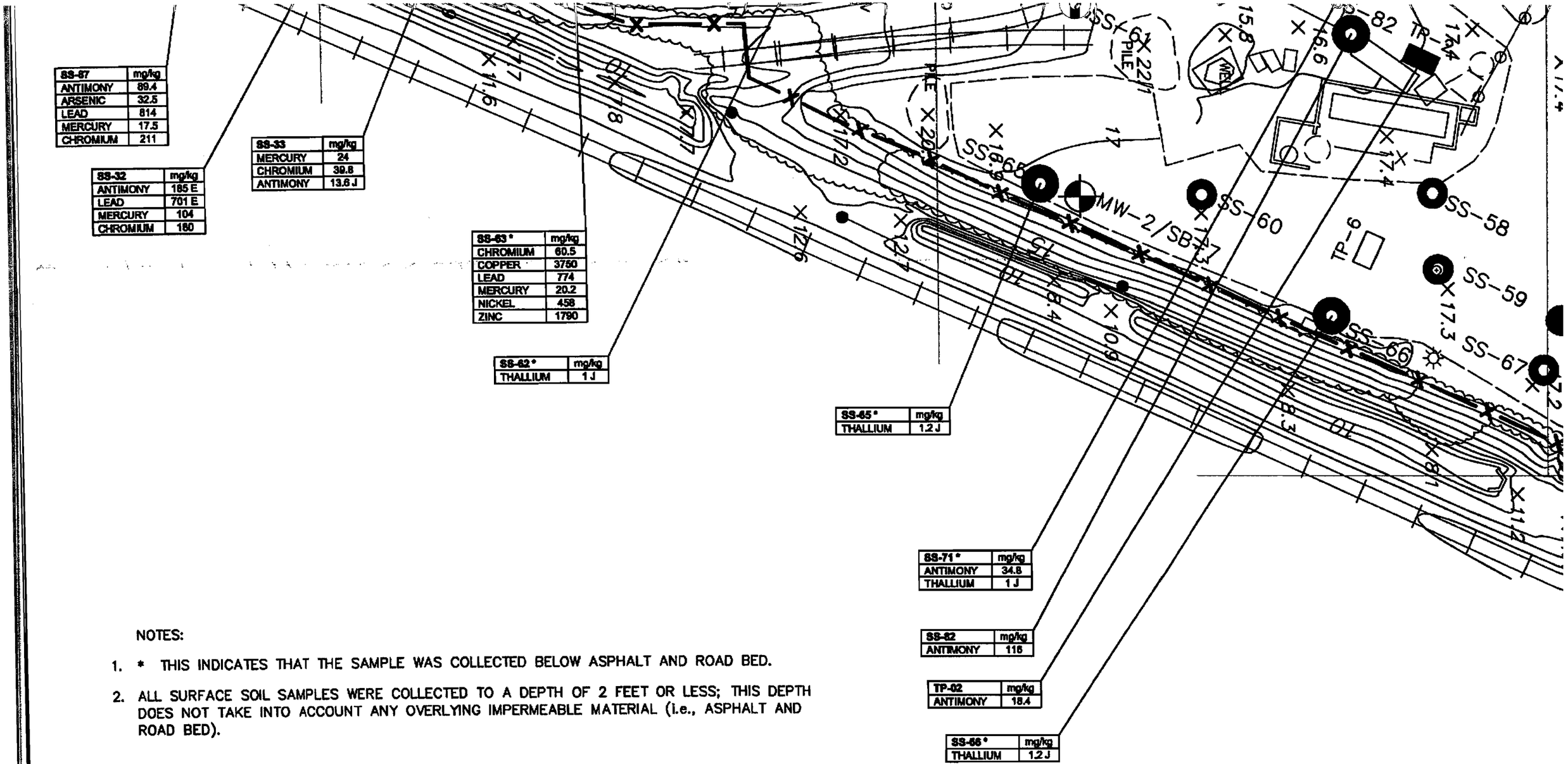


NOTES:

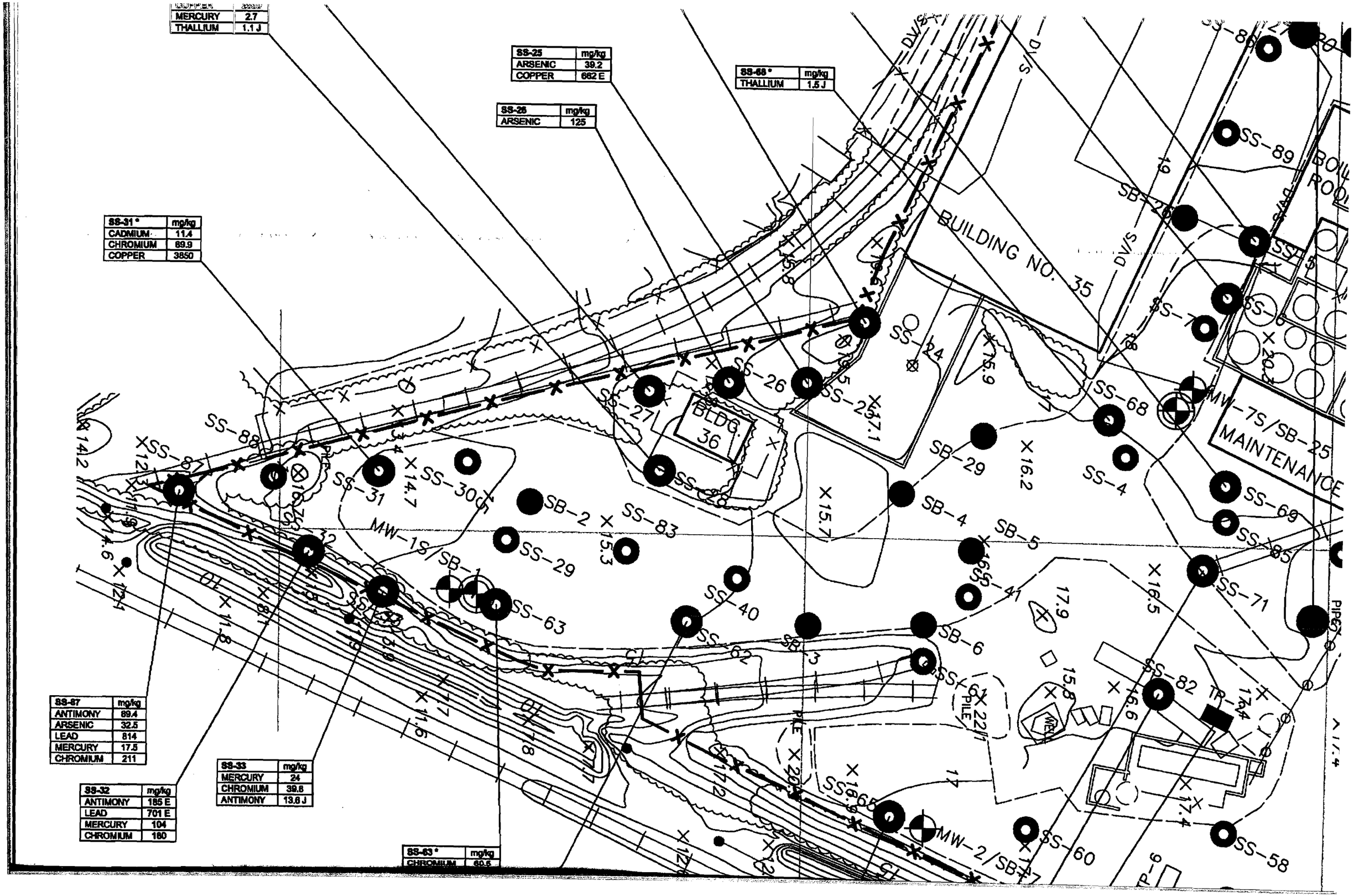
1. * THIS INDICATES THAT THE SAMPLE WAS COLLECTED BELOW ASPHALT AND ROAD BED.
2. ALL SURFACE SOIL SAMPLES WERE COLLECTED TO A DEPTH OF 2 FEET OR LESS; THIS DEPTH DOES NOT TAKE INTO ACCOUNT ANY OVERLYING IMPERMEABLE MATERIAL (i.e., ASPHALT AND ROAD BED).

MALCOLM PIRNIE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

FW

WHITE CHEMICAL CORPORATION SUPERFUND
NEWARK, NEW JERSEY
USEPA RAC II PROGRAM
CONTRACT NO. 68-W-98-214; W.A. NO. 027-RI



MERCURY 2.7
THALLIUM 1.1 J
SS-25 mg/kg
ARSENIC 39.2
COPPER 662 E
SS-26 mg/kg
ARSENIC 125
SS-68 * mg/kg
THALLIUM 1.5 J
SS-31 * mg/kg
CADMIUM 11.4
CHROMIUM 89.9
COPPER 3850
SS-87 mg/kg
ANTIMONY 89.4
ARSENIC 32.5
LEAD 814
MERCURY 17.5
CHROMIUM 211
SS-32 mg/kg
ANTIMONY 185 E
LEAD 701 E
MERCURY 104
CHROMIUM 180
SS-33 mg/kg
MERCURY 24
CHROMIUM 39.8
ANTIMONY 13.6 J
SS-63 * mg/kg
CHROMIUM 60.5
BUILDING NO. 35
BLDG. 36
MAINTENANCE
MW-1S/SB-1
MW-2/SB-2
MW-7S/SB-25
SS-88
SS-87
SS-31
SS-30
SS-29
SS-63
SS-83
SS-27
SS-26
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SS-62
SS-40
SS-41
SB-2
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SB-29
SB-26
SS-89
SS-7
SS-6
DV/S
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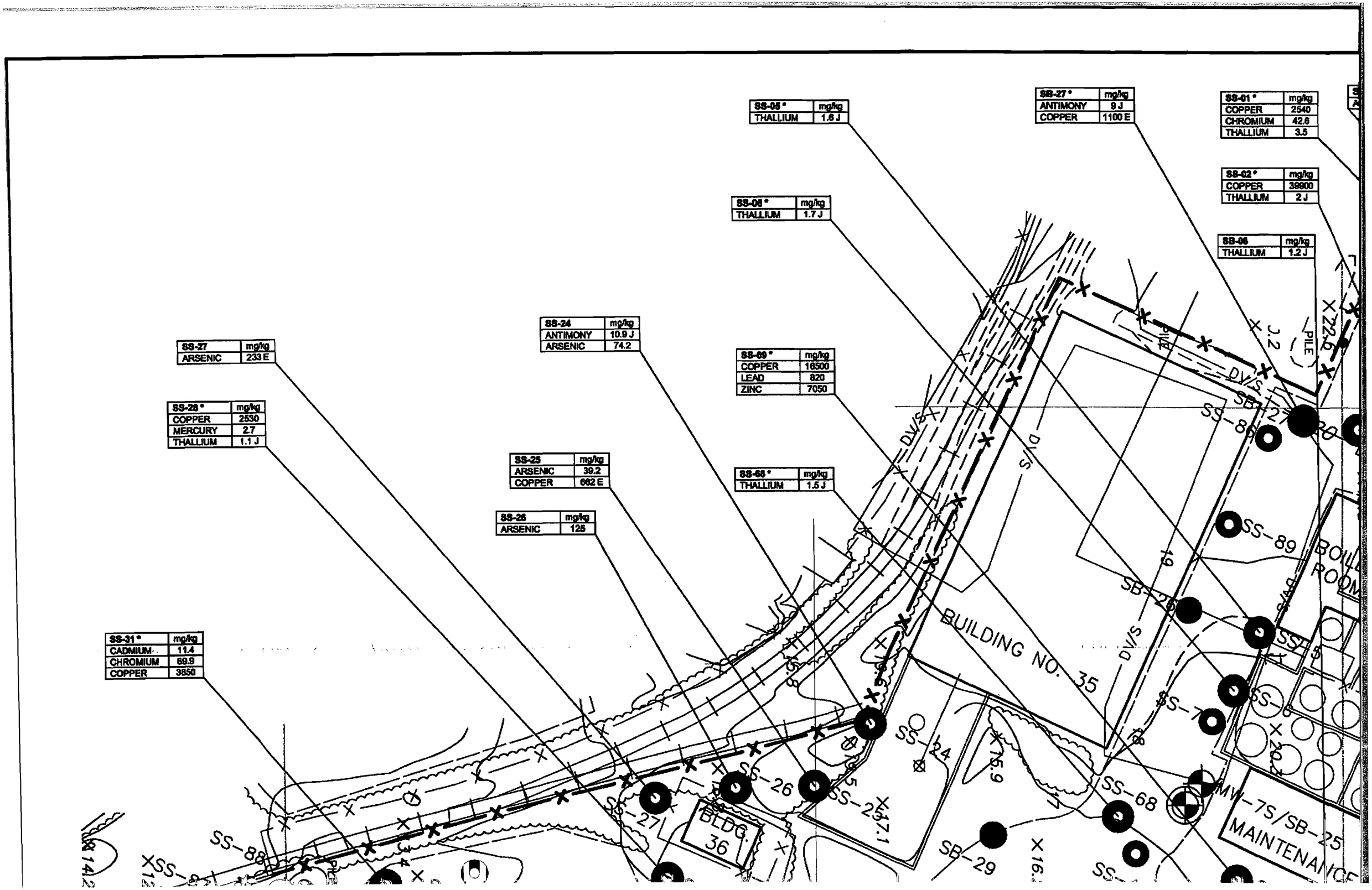
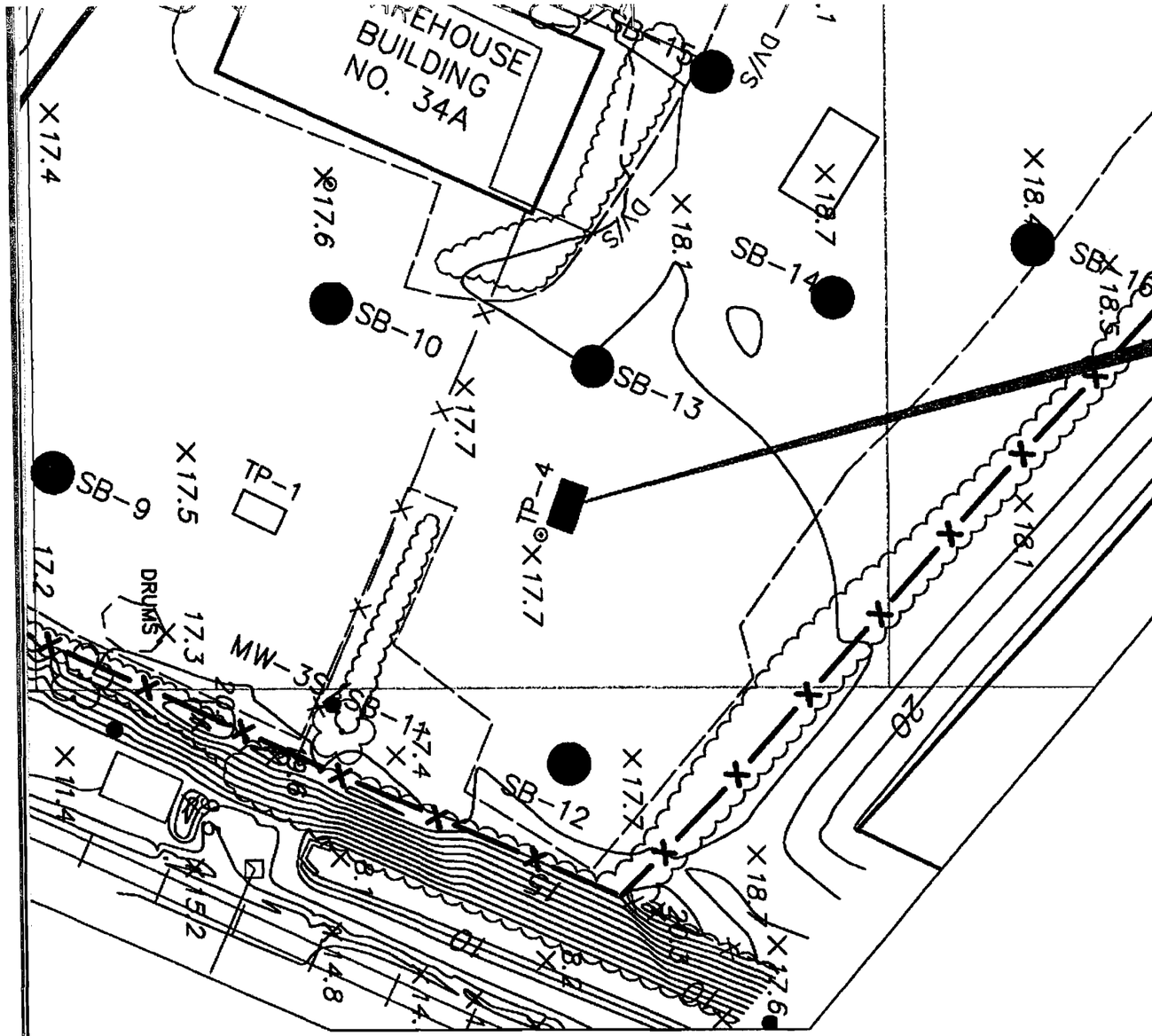

SS-27 mg/kg
ARSENIC 233 E
SS-28 * mg/kg
COPPER 2530
MERCURY 2.7
THALLIUM 1.1 J
SS-24 mg/kg
ANTIMONY 10.9 J
ARSENIC 74.2
SS-25 mg/kg
ARSENIC 39.2
COPPER 662 E
SS-26 mg/kg
ARSENIC 125
SS-31 * mg/kg
CADMIUM 11.4
CHROMIUM 89.9
COPPER 3850
SS-05 * mg/kg
THALLIUM 1.6 J
SS-06 * mg/kg
THALLIUM 1.7 J
SS-09 * mg/kg
COPPER 16500
LEAD 820
ZINC 7050
SS-08 * mg/kg
THALLIUM 1.5 J
SB-27 * mg/kg
ANTIMONY 9 J
COPPER 1100 E
SS-01 * mg/kg
COPPER 2540
CHROMIUM 42.6
THALLIUM 3.5
SS-02 * mg/kg
COPPER 39900
THALLIUM 2 J
SB-06 mg/kg
THALLIUM 1.2 J
BUILDING NO. 35
BLDG. 36
MAINTENANCE
SS-88
SS-26
SS-27
SS-25
SS-24
SS-68
SS-89
SB-29
SB-28
MW-7S/SB-25
DV/S
PILE



TP-04 *	ug/kg
SAMPLE DEPTH	4'-5'
BENZO(A)ANTHRACENE	2200
BENZO(A)PYRENE	1400
DIBENZ(A,H)ANTHRACENE	580

LEGEND

- MW-1 — SHALLOW MONITORING WELL AND SOIL BORING
- MW-1 — DEEP MONITORING WELL
- SB-1 — SOIL BORING LOCATION
- SS-1 — SURFACE SAMPLING LOCATION
- TP-1 — TEST PIT
- SD-1 — SUMP SEDIMENT SAMPLING LOCATION
- ST-1 — STATIONS
- TREE OR SHRUB
- HYDRANT
- TELEPHONE POLE
- LIGHT POST
- PROPERTY LINE
- ELEVATION CONTOUR IN FT
- FENCE (PROPERTY BOUNDARY)
- FENCE
- RAILROAD
- TREE LINE
- CONCENTRATIONS ABOVE EPA AND/OR NJDEP ARARs

15 0 15 30
1"=30'

SITE

CO-026J

SVOCs ABOVE USEPA AND/OR NJDEP TBCs IN SUBSURFACE SOIL

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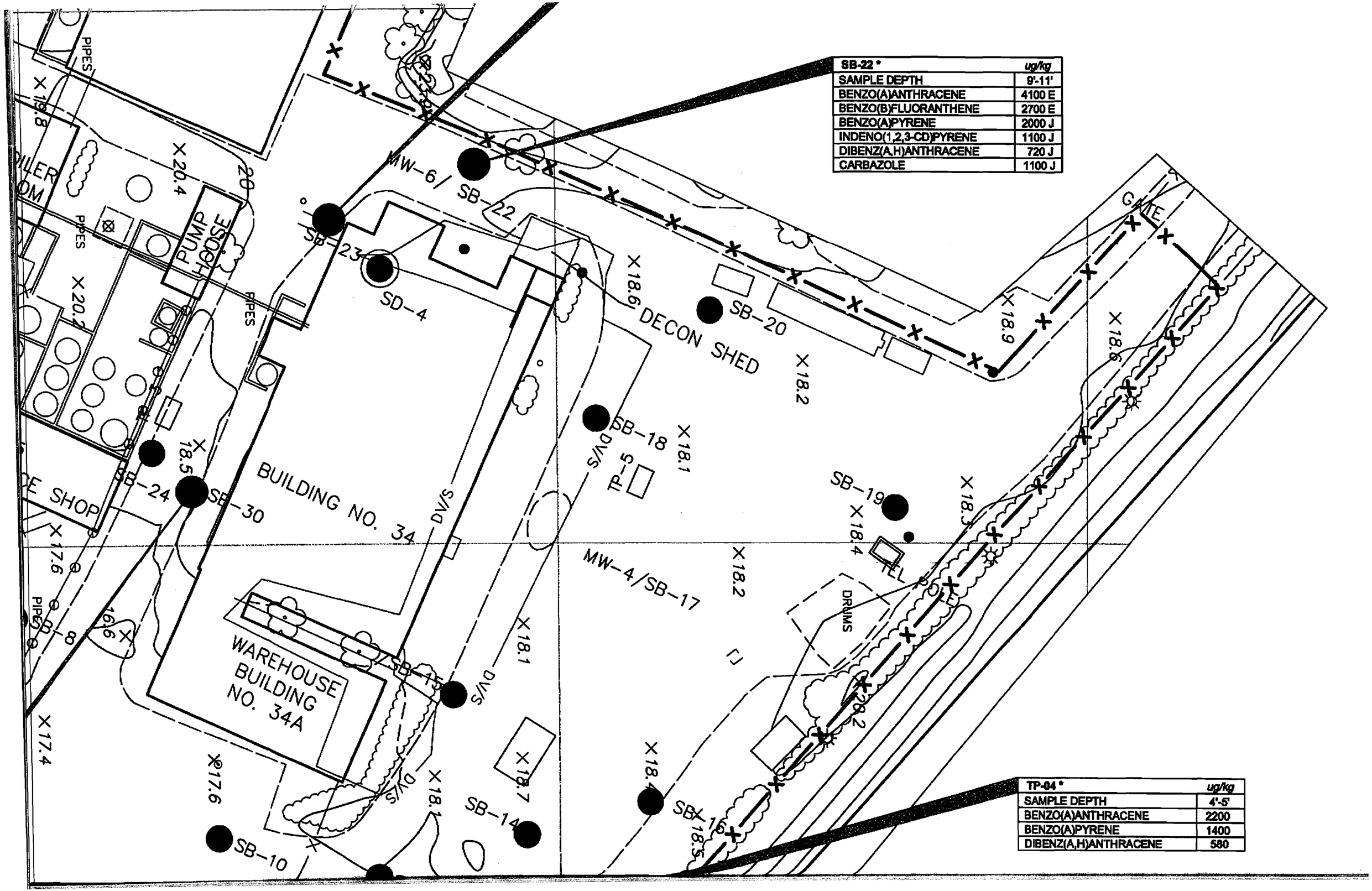
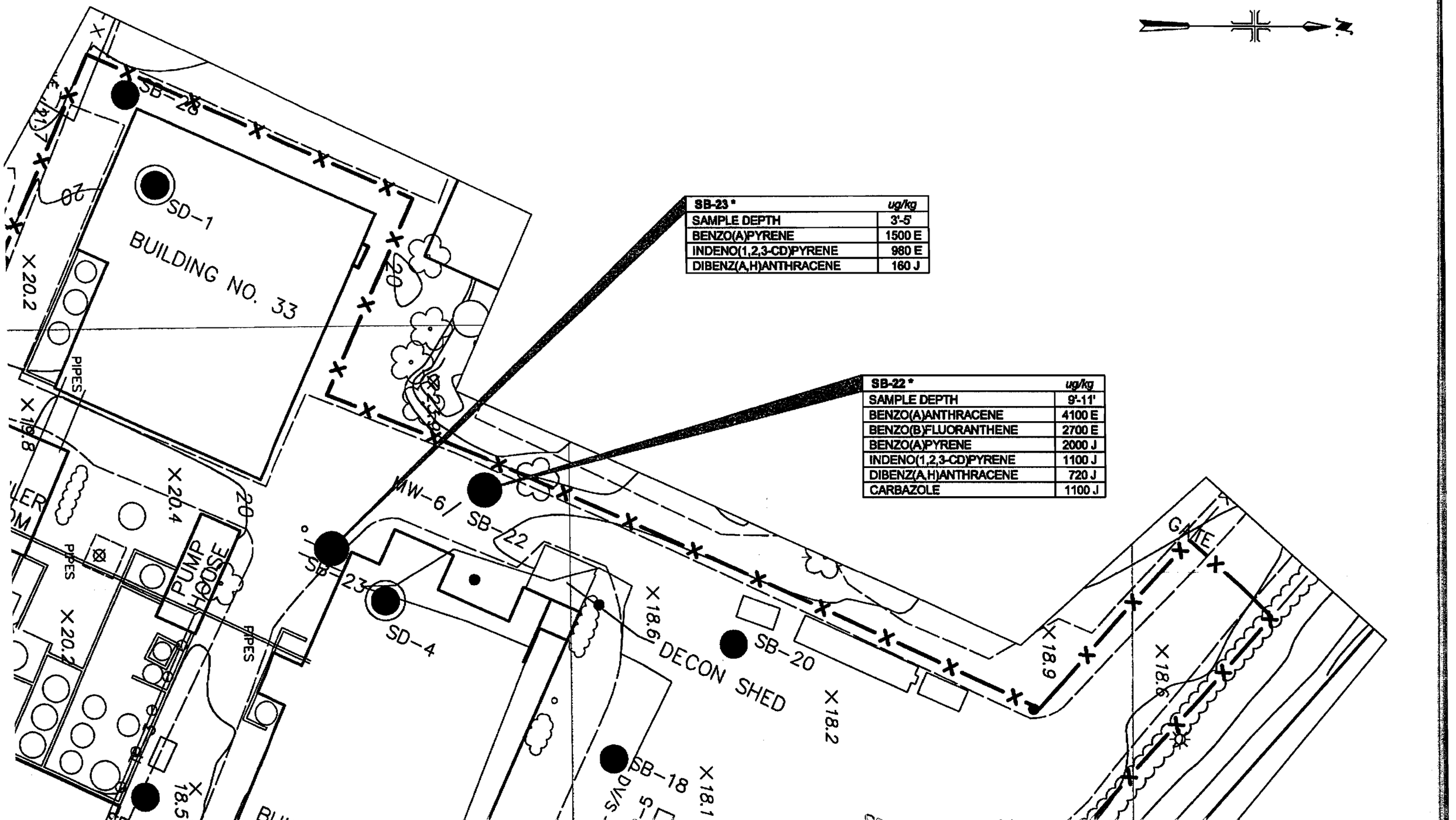
PLATE 9



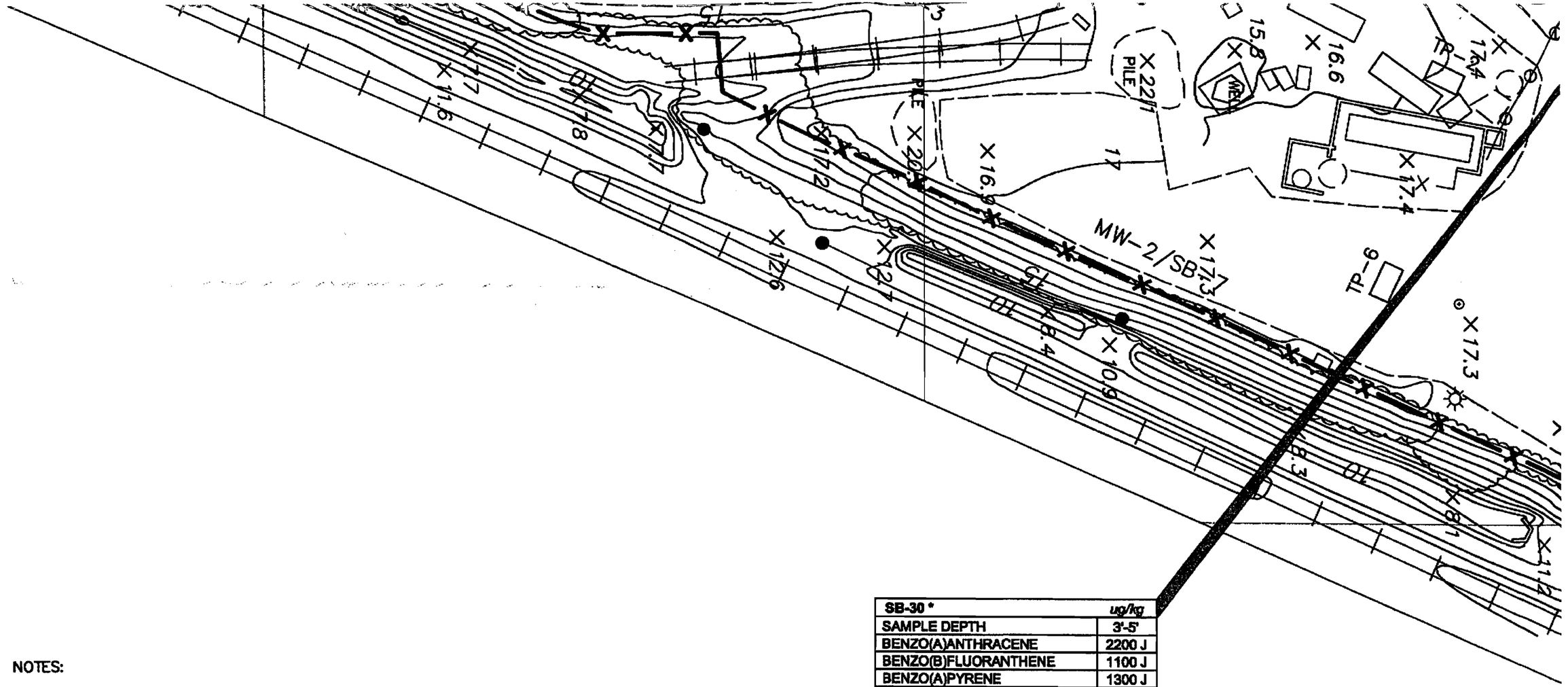
SB-22 *	ug/kg
SAMPLE DEPTH	9'-11'
BENZO(A)ANTHRACENE	4100 E
BENZO(B)FLUORANTHENE	2700 E
BENZO(A)PYRENE	2000 J
INDENO(1,2,3-CD)PYRENE	1100 J
DIBENZ(A,H)ANTHRACENE	720 J
CARBAZOLE	1100 J

TP-04 *	ug/kg
SAMPLE DEPTH	4'-5'
BENZO(A)ANTHRACENE	2200
BENZO(A)PYRENE	1400
DIBENZ(A,H)ANTHRACENE	580



SB-23 *	ug/kg
SAMPLE DEPTH	3'-5'
BENZO(A)PYRENE	1500 E
INDENO(1,2,3-CD)PYRENE	980 E
DIBENZ(A,H)ANTHRACENE	160 J

SB-22 *	ug/kg
SAMPLE DEPTH	9'-11'
BENZO(A)ANTHRACENE	4100 E
BENZO(B)FLUORANTHENE	2700 E
BENZO(A)PYRENE	2000 J
INDENO(1,2,3-CD)PYRENE	1100 J
DIBENZ(A,H)ANTHRACENE	720 J
CARBAZOLE	1100 J



SB-30 *	ug/kg
SAMPLE DEPTH	3'-5'
BENZO(A)ANTHRACENE	2200 J
BENZO(B)FLUORANTHENE	1100 J
BENZO(A)PYRENE	1300 J
CARBAZOLE	950 J

NOTES:

1. * SAMPLE LOCATION WAS COVERED WITH 1 FOOT OF IMPERMEABLE MATERIAL (i.e., ASPHALT AND RIAD BED). THE SAMPLE DEPTH GIVEN TAKES INTO ACCOUNT THIS MATERIAL (e.g., SAMPLES COLLECTED FROM 5–7 FEET WERE COLLECTED BENEATH 1 FOOT OF MATERIAL AND THEN WERE COLLECTED FROM 4–6 FEET IN THE SOIL).

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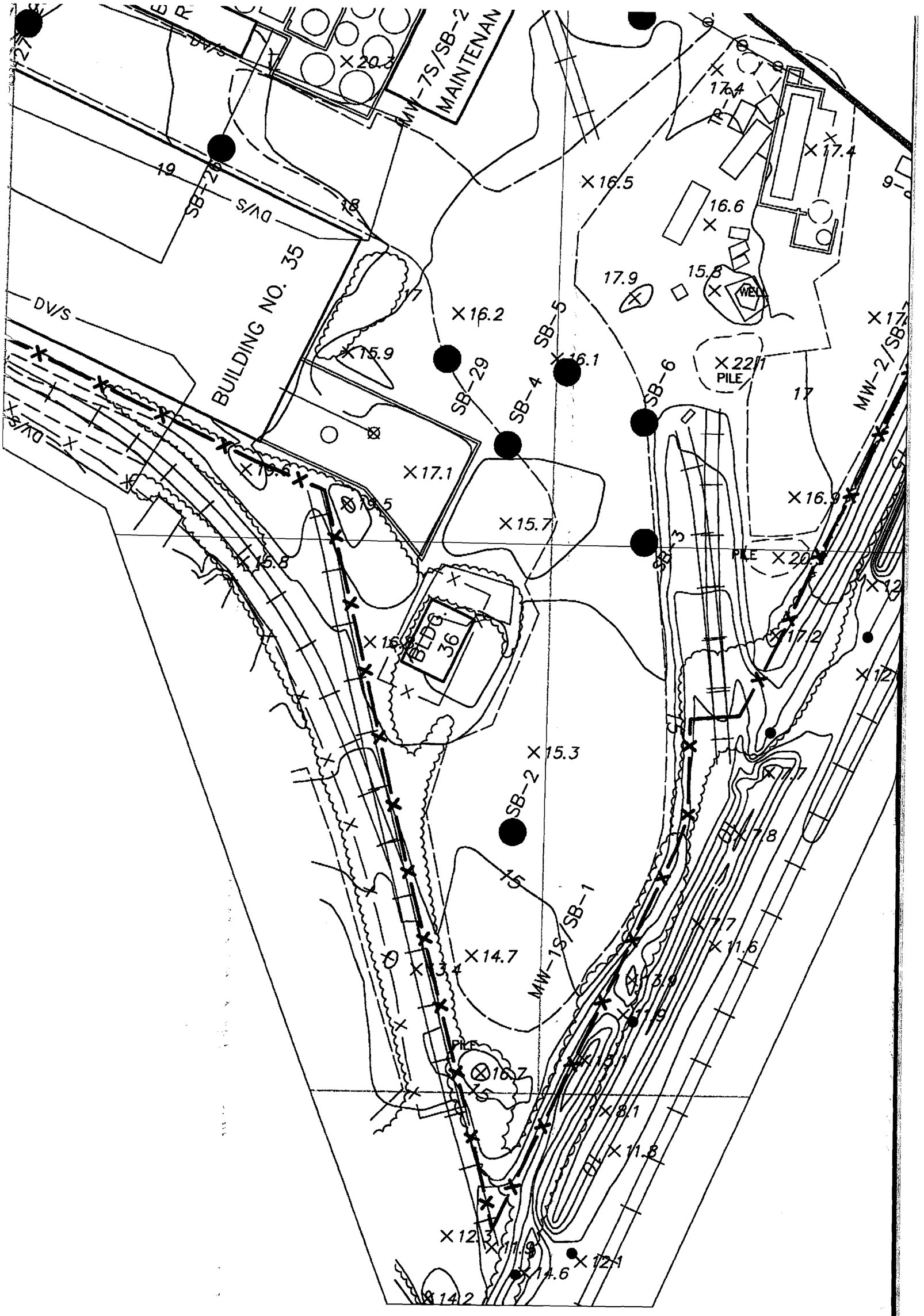
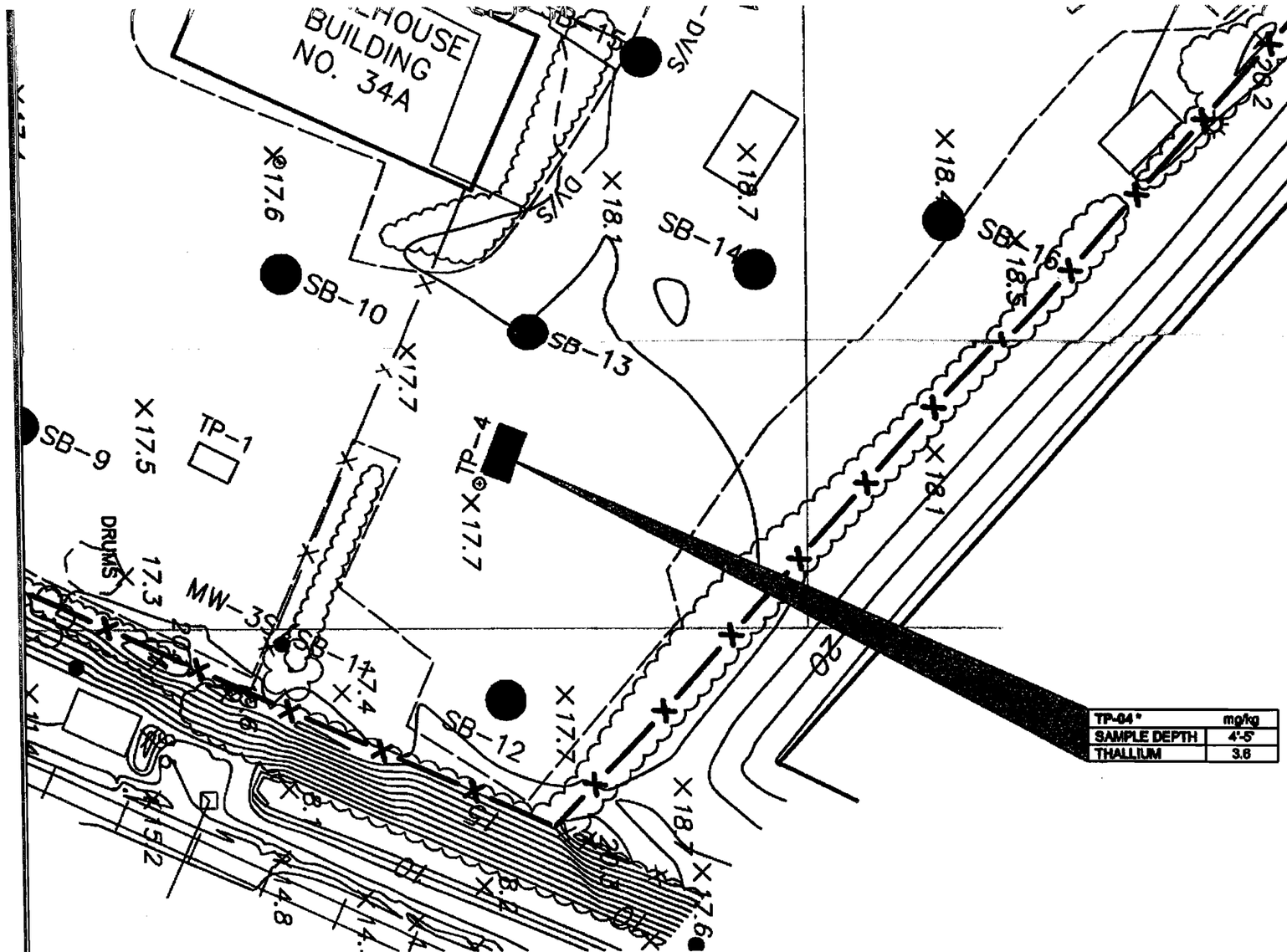
NEWARK, NEW JERSEY
USEPA RAC II PROGRAM
CONTRACT NO. 68–W–98–214; W.A. NO. 027–RI



MW-7S/SB-2
MAINTENAN
BUILDING NO. 35
DV/S
SB-26
SB-29
SB-4
SB-5
SB-6
SB-3
SB-2
BLDG. 36
MW-1S/SB-1
MW-2/SB-7
PILE
WELL

BUILDING NO. 35
BLDG. 36
SB-26
SB-27
SB-29
MW-7S/SB-25
DV/S
PILE
X17.1



LEGEND

- MW-1 — SHALLOW MONITORING WELL AND SOIL BORING
- MW-1 — DEEP MONITORING WELL
- SB-1 — SOIL BORING LOCATION
- SURFACE SAMPLING LOCATION
- TP-1 — TEST PIT
- SD-1 — SUMP SEDIMENT SAMPLING LOCATION
- ST-1 — STATIONS
- TREE OR SHRUB
- HYDRANT
- TELEPHONE POLE
- LIGHT POST
- PROPERTY LINE
- ELEVATION CONTOUR IN FT
- FENCE (PROPERTY BOUNDARY)
- FENCE
- RAILROAD
- TREE LINE
- CONCENTRATIONS ABOVE EPA AND/OR NJDEP ARARs

15 0 15 30

1"=30'

SITE

CO-026J

INORGANICS ABOVE USEPA AND/OR NJDEP TBCs IN SUB-SURFACE SOIL

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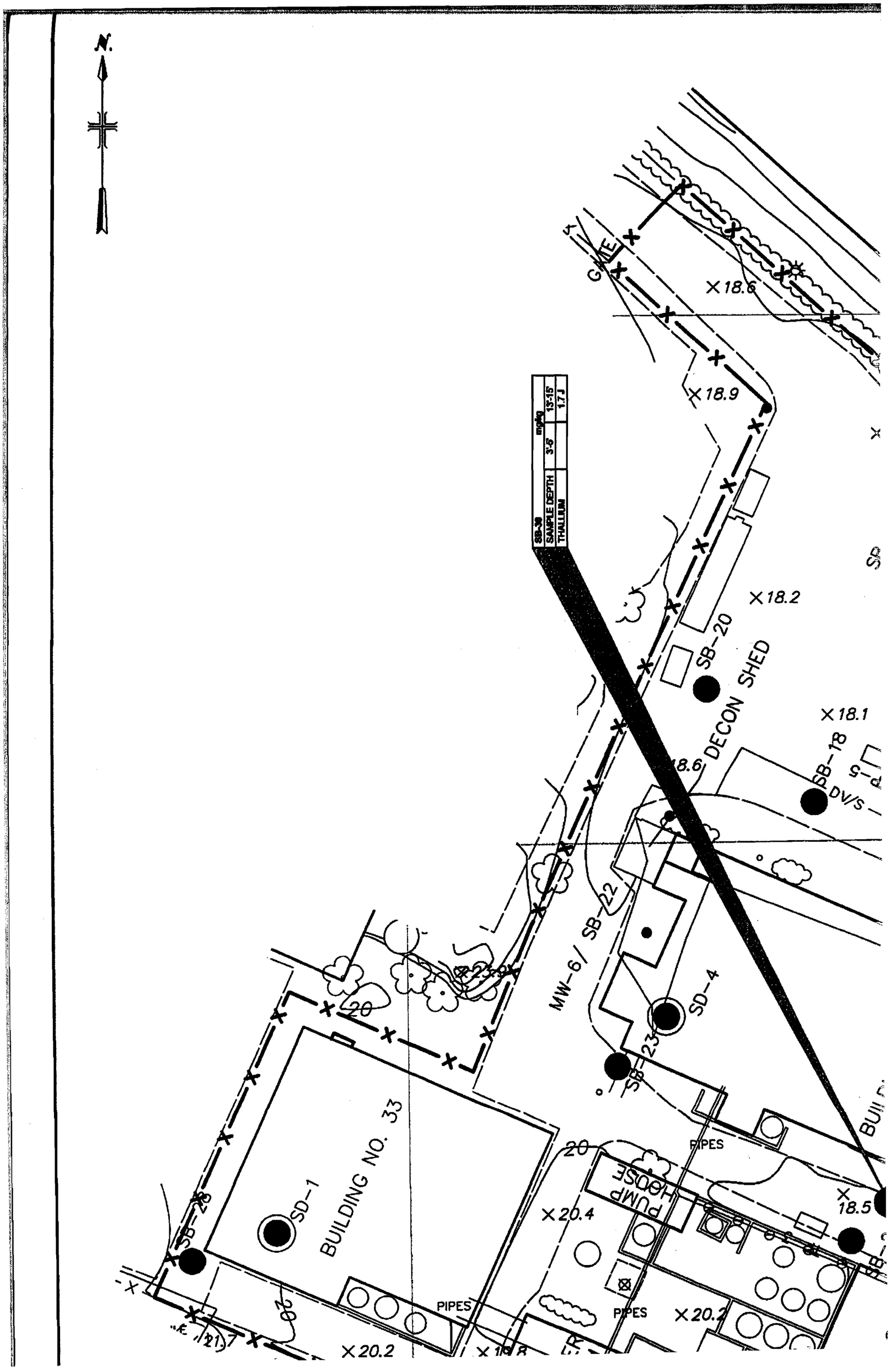
PLATE 10

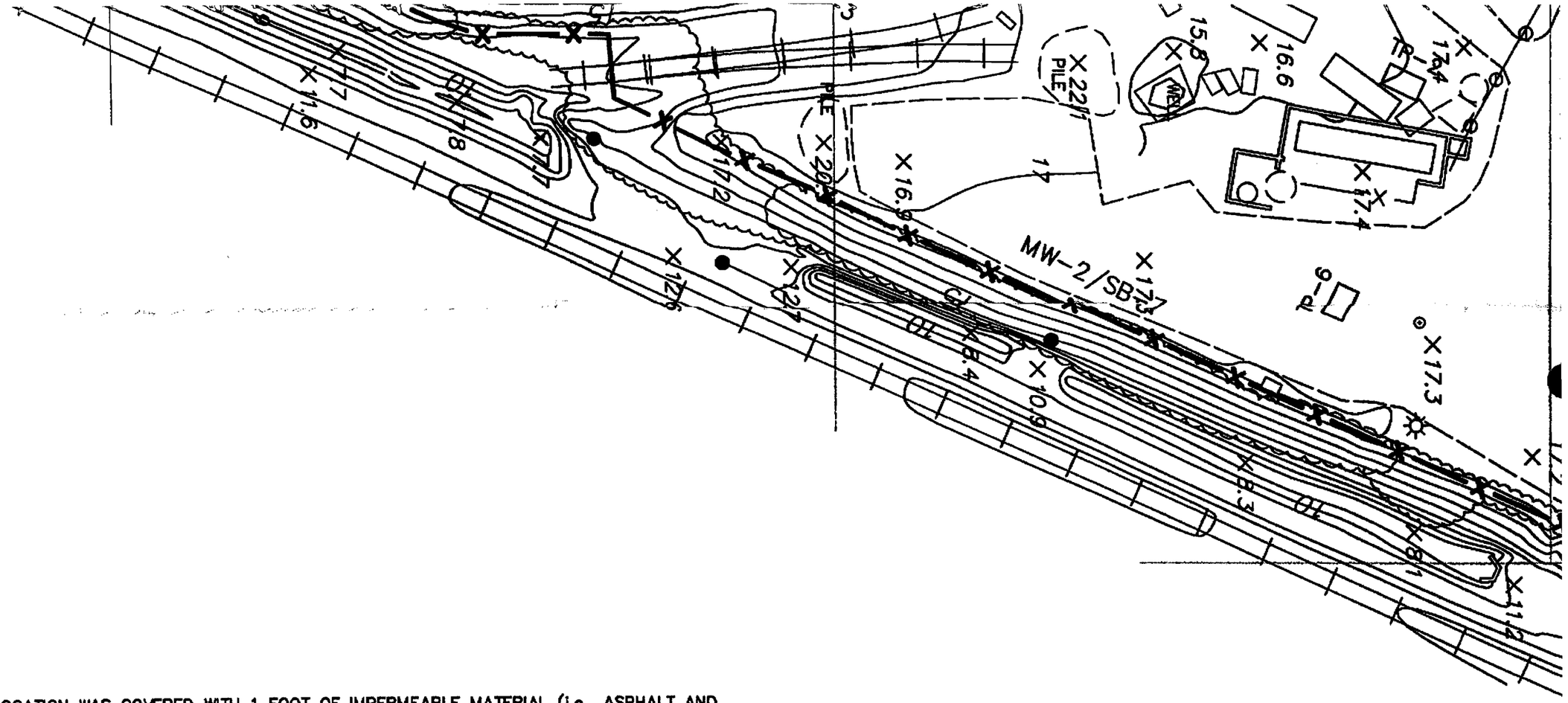
SB-39	mg/kg	
SAMPLE DEPTH	3'-5'	13'-15'
THALLIUM		1.7 J

SB-19	mg/kg	
SAMPLE DEPTH	5'-7'	9'-11'
THALLIUM		0.97 J

LEGEND

- MW-1 — SHALLOW MONITORING WELL AND SOIL BORING
- MW-1 — DEEP MONITORING WELL
- SB-1 — SOIL BORING LOCATION
- SURFACE SAMPLING LOCATION
- TP-1 — TEST PIT
- SD-1 — SUMP SEDIMENT SAMPLING LOCATION


N.
SB-38
mg/kg
SAMPLE DEPTH
3'-5'
13'-15'
THALLIUM
1.7 J
GATE
18.6
18.9
18.2
SB-20
DECON SHED
18.1
SB-18
DV/S
18.6
MW-6/ SB-22
SD-4
SB-23
20
BUILDING NO. 33
SD-1
SB-28
PIPES
PUMP HOUSE
20
20.4
18.5
PIPES
PIPES
20.2
20
21.7
20.2



NOTES:

1. * SAMPLE LOCATION WAS COVERED WITH 1 FOOT OF IMPERMEABLE MATERIAL (i.e., ASPHALT AND ROAD BED.). THE SAMPLE DEPTH GIVEN TAKES INTO ACCOUNT THIS MATERIAL (e.g., SAMPLES COLLECTED FROM 1–3 FEET WERE COLLECTED BENEATH 1 FOOT OF MATERIAL AND THEN WERE COLLECTED FROM 1 TO 2 FEET IN THE SOIL).
2. ** SAMPLE LOCATION WAS COVERED WITH 1.5 FEET OF IMPERMEABLE MATERIAL (i.e., ASPHALT AND ROAD BED). THE SAMPLE DEPTH GIVEN TAKES INTO ACCOUNT THIS MATERIAL (e.g., SAMPLES COLLECTED FROM 1.5–3.5 FEET WERE COLLECTED BENEATH 1.5 FEET OF MATERIAL AND THEN WERE COLLECTED FROM 0 TO 2 FEET IN THE SOIL).
3. *** SAMPLE LOCATION WAS COVERED WITH 1.5 FEET OF FROZEN GROUND.

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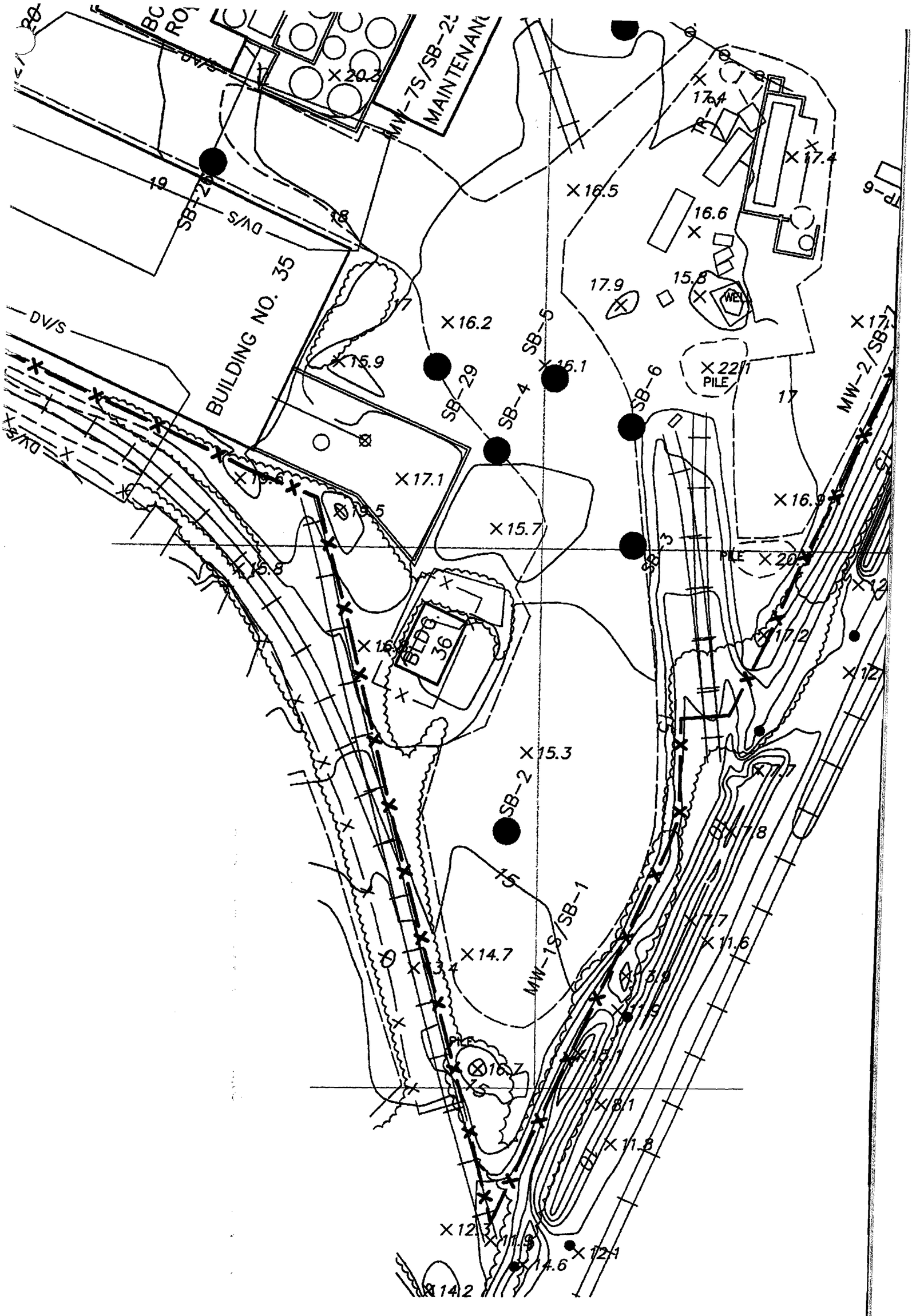
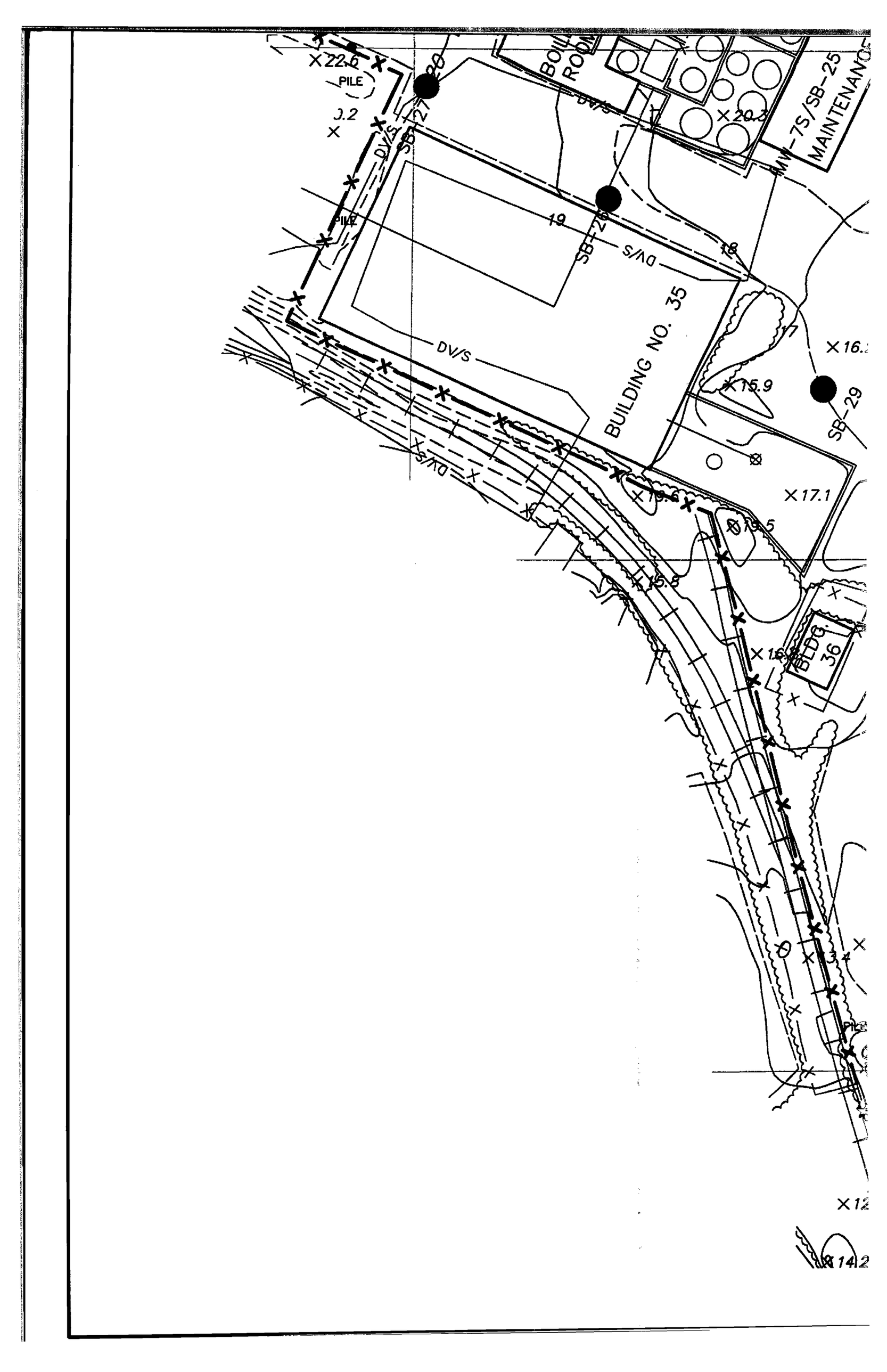


BUILDING NO. 35
MW-7S/SB-25
MAINTENANC
SB-26
SB-29
SB-4
SB-5
SB-6
SB-3
SB-2
MW-1S/SB-1
MW-2/SB-7
BLDG. 36
DV/S
PILE
WELL



22.6
PILE
DV/S
SB-27
20
BOIL
ROOM
DV/S
20.3
MW-7S/SB-25
MAINTENANC
PILE
19
SB-26
DV/S
18
BUILDING NO. 35
DV/S
17
16.
15.9
SB-29
DV/S
17.1
19.6
19.5
15.8
BLDG.
36
16.8
13.4
PILE
12
14.2

1,1,2,2-TETRACHLOROETHANE	34 ug/L

MW-3D	
1,2-DICHLOROETHANE	20,000 ug/L
TRICHLOROETHENE	150J ug/L
1,1,2-TRICHLOROETHANE	160J ug/L
TETRACHLOROETHENE	670J ug/L
1,1,2,2-TETRACHLOROETHANE	88J ug/L

MW-3S	
1,2-DICHLOROETHENE	450J ug/L
1,2-DICHLOROETHANE	230 ug/L
TRICHLOROETHENE	1700 ug/L
1,1,2-TRICHLOROETHANE	240 ug/L
TETRACHLOROETHENE	23J ug/L
1,1,2,2-TETRACHLOROETHANE	1500 ug/L

LEGEND

- MW-1 SHALLOW MONITORING WELL AND SOIL BORING
- MW-1 DEEP MONITORING WELL
- SB-1 SOIL BORING LOCATION
- SS-1 SURFACE SAMPLING LOCATION
- TP-1 TEST PIT
- SD-1 SUMP SEDIMENT SAMPLING LOCATION
- ST-1 STATIONS
- TREE OR SHRUB
- HYDRANT
- TELEPHONE POLE
- LIGHT POST
- PROPERTY LINE
- ELEVATION CONTOUR IN FT
- FENCE (PROPERTY BOUNDARY)
- FENCE
- RAILROAD
- TREE LINE
- CONCENTRATIONS ABOVE EPA AND/OR NJDEP ARARs

15 0 15 30
1"=30'

SITE

CO–026J

VOCS AND WATER QUALITY PARAMETERS ABOVE USEPA AND/OR NJDEP ARARS IN GROUNDWATER - 1ST ROUND OF SAMPLING

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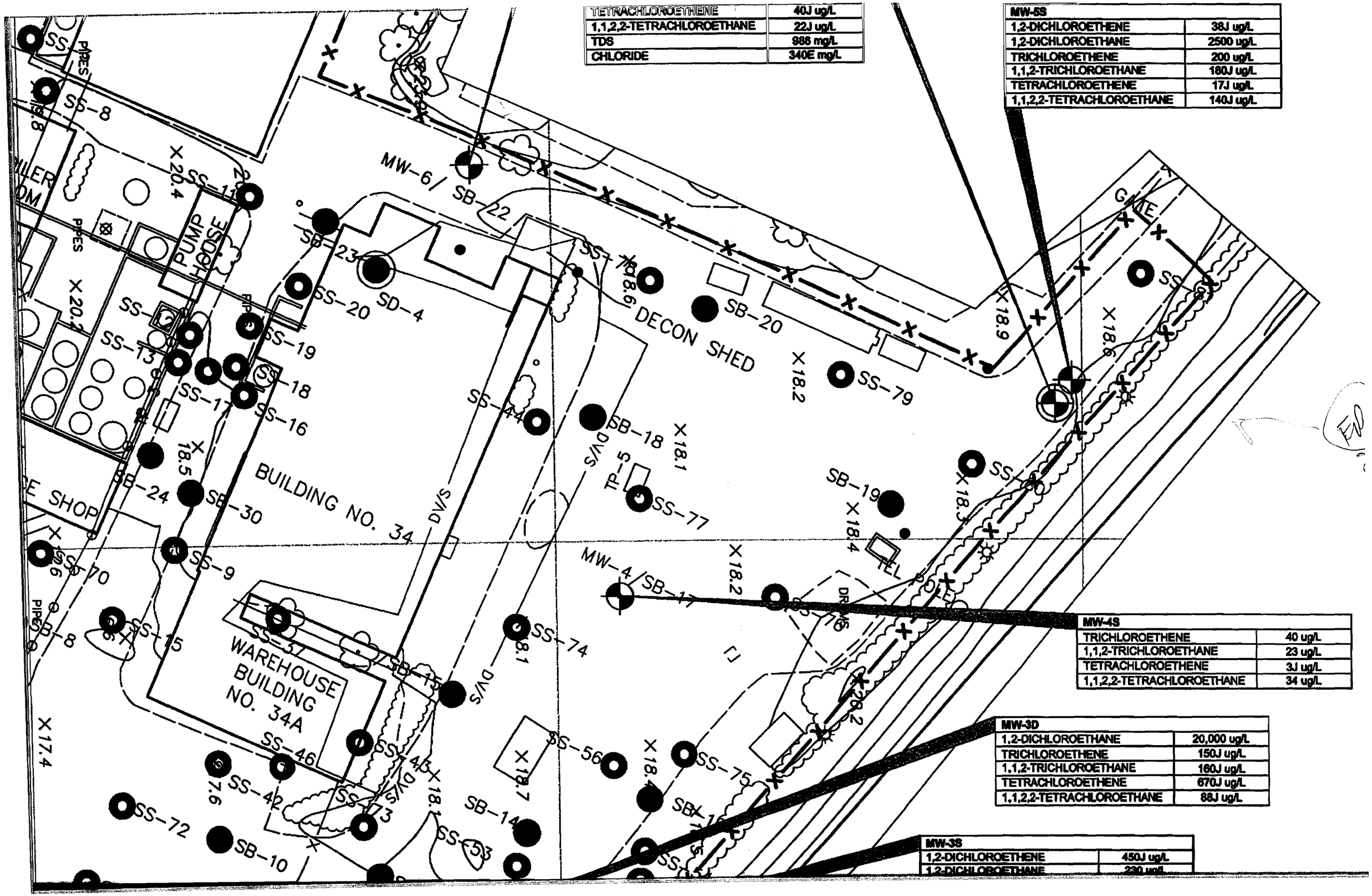
PLATE 11



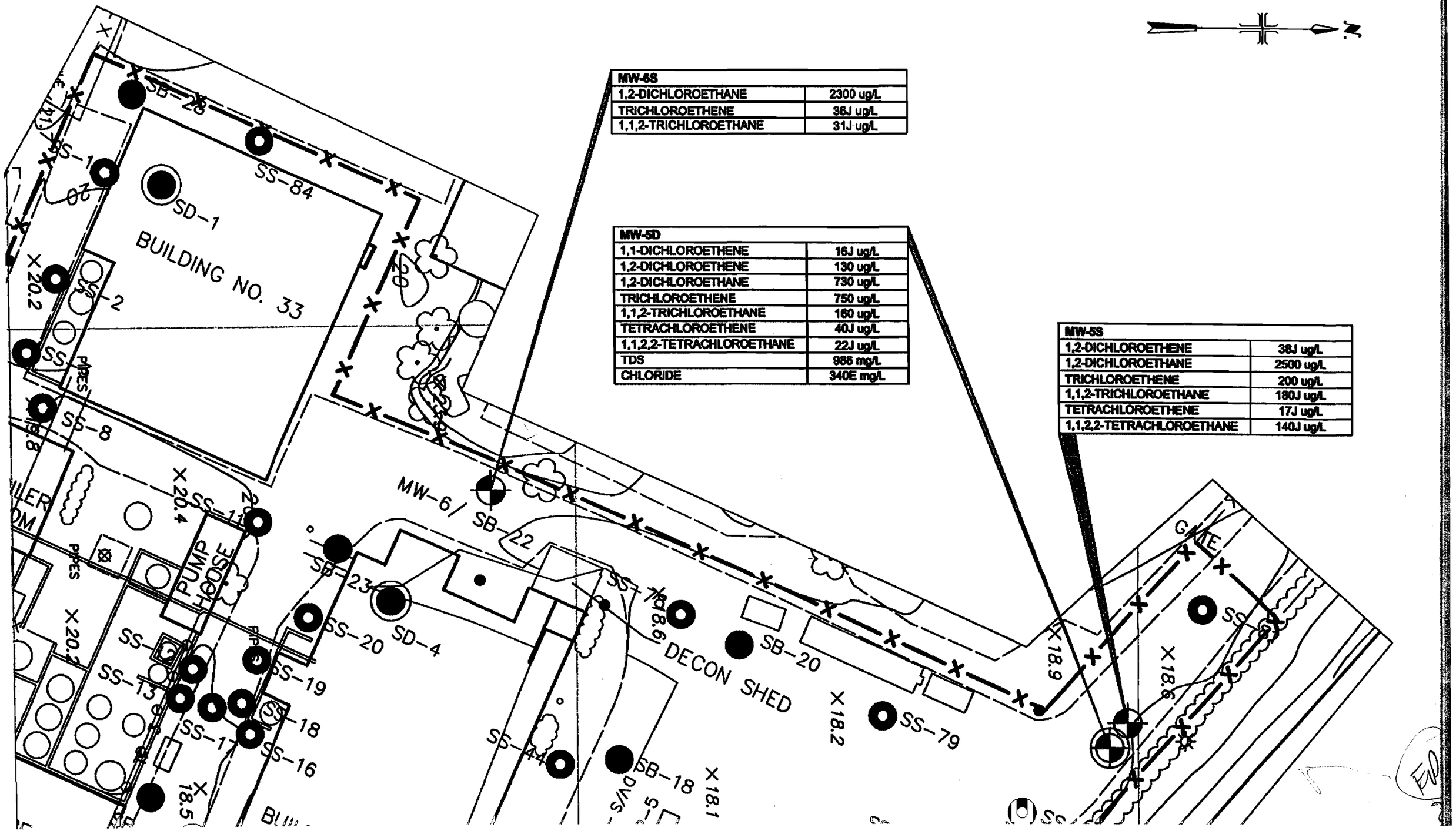
TETRACHLOROETHENE	40J ug/L
1,1,2,2-TETRACHLOROETHANE	22J ug/L
TDS	986 mg/L
CHLORIDE	340E mg/L

MW-5S	
1,2-DICHLOROETHENE	38J ug/L
1,2-DICHLOROETHANE	2500 ug/L
TRICHLOROETHENE	200 ug/L
1,1,2-TRICHLOROETHANE	180J ug/L
TETRACHLOROETHENE	17J ug/L
1,1,2,2-TETRACHLOROETHANE	140J ug/L

MW-4S	
TRICHLOROETHENE	40 ug/L
1,1,2-TRICHLOROETHANE	23 ug/L
TETRACHLOROETHENE	3J ug/L
1,1,2,2-TETRACHLOROETHANE	34 ug/L

MW-3D	
1,2-DICHLOROETHANE	20,000 ug/L
TRICHLOROETHENE	150J ug/L
1,1,2-TRICHLOROETHANE	160J ug/L
TETRACHLOROETHENE	670J ug/L
1,1,2,2-TETRACHLOROETHANE	88J ug/L

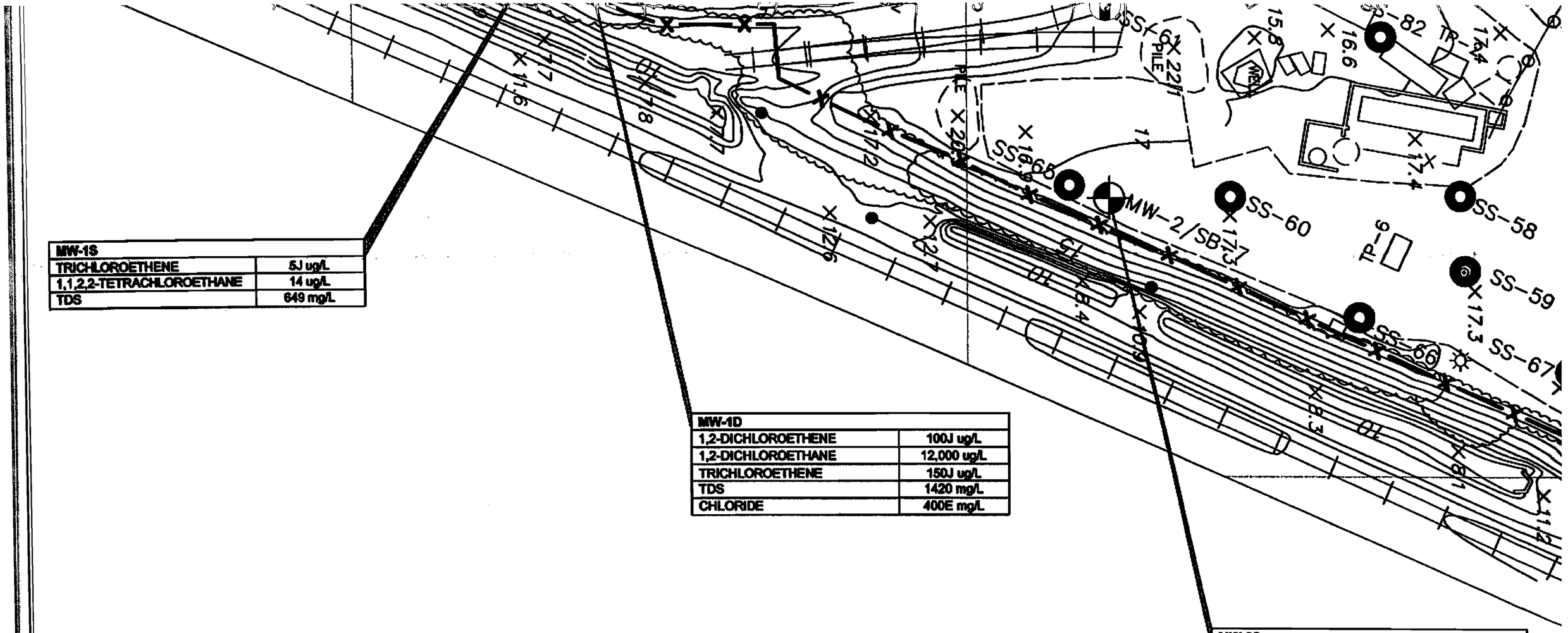
MW-3S	
1,2-DICHLOROETHENE	450J ug/L
1,2-DICHLOROETHANE	230 ug/L



MW-6S	
1,2-DICHLOROETHANE	2300 ug/L
TRICHLOROETHENE	36J ug/L
1,1,2-TRICHLOROETHANE	31J ug/L

MW-5D	
1,1-DICHLOROETHENE	16J ug/L
1,2-DICHLOROETHENE	130 ug/L
1,2-DICHLOROETHANE	730 ug/L
TRICHLOROETHENE	750 ug/L
1,1,2-TRICHLOROETHANE	160 ug/L
TETRACHLOROETHENE	40J ug/L
1,1,2,2-TETRACHLOROETHANE	22J ug/L
TDS	986 mg/L
CHLORIDE	340E mg/L

MW-5S	
1,2-DICHLOROETHENE	38J ug/L
1,2-DICHLOROETHANE	2500 ug/L
TRICHLOROETHENE	200 ug/L
1,1,2-TRICHLOROETHANE	180J ug/L
TETRACHLOROETHENE	17J ug/L
1,1,2,2-TETRACHLOROETHANE	140J ug/L



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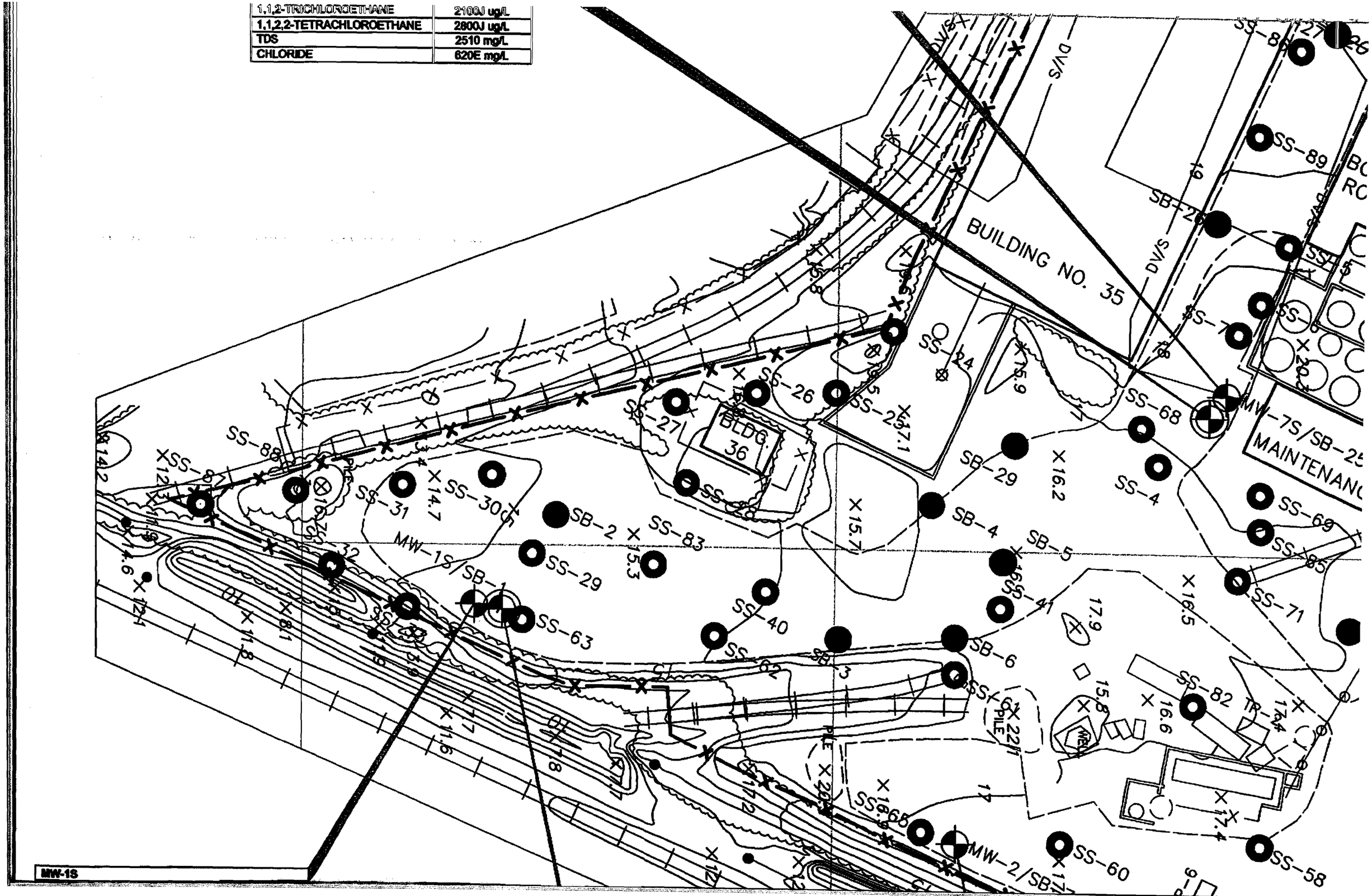
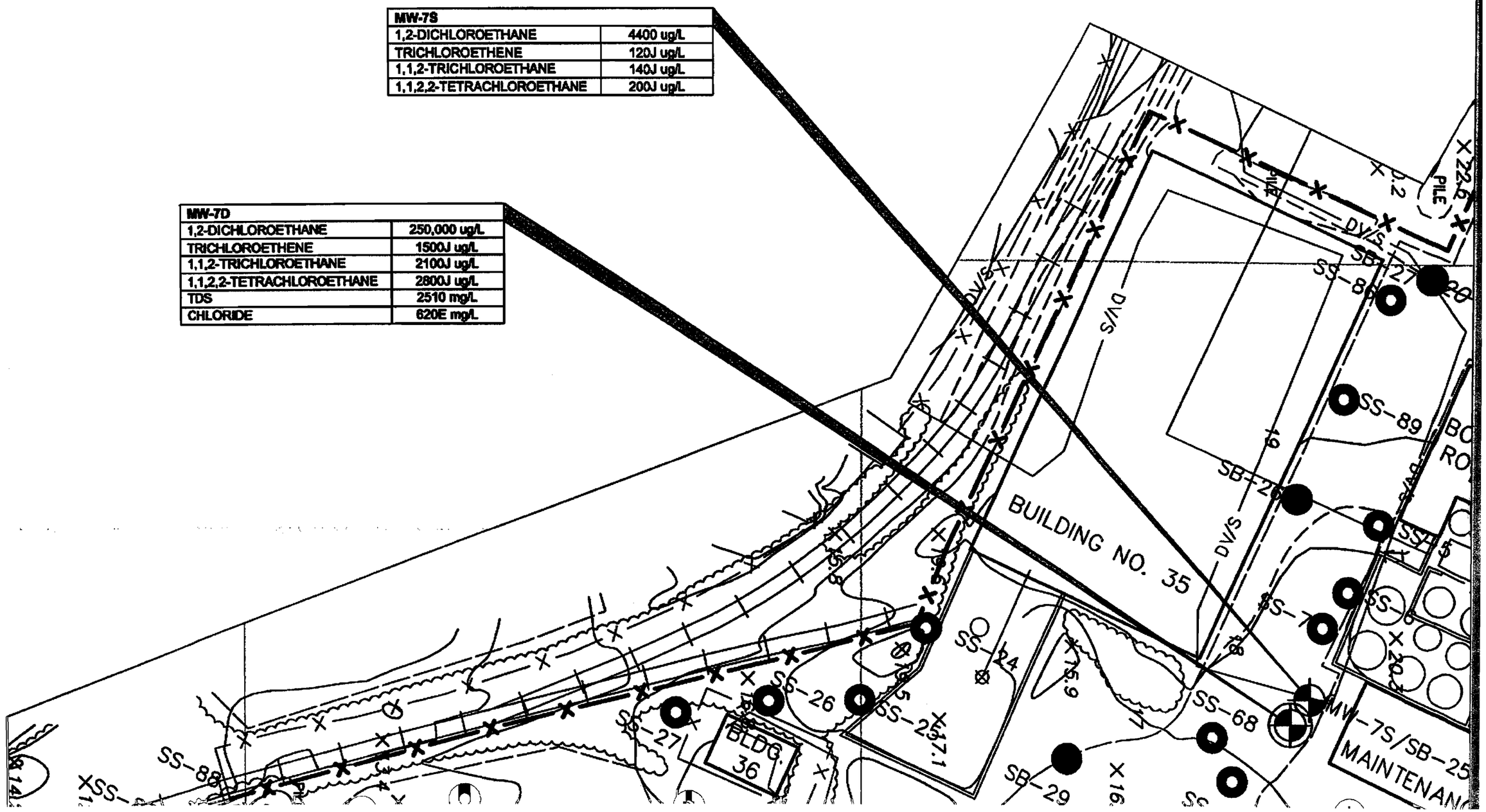
USEPA RAC II PROGRAM
CONTRACT NO. 68-W-98-214; W.A. NO. 027-RI

1,1,2-TRICHLOROETHANE	2100J ug/L
1,1,2,2-TETRACHLOROETHANE	2800J ug/L
TDS	2510 mg/L
CHLORIDE	620E mg/L



MW-7S	
1,2-DICHLOROETHANE	4400 ug/L
TRICHLOROETHENE	120J ug/L
1,1,2-TRICHLOROETHANE	140J ug/L
1,1,2,2-TETRACHLOROETHANE	200J ug/L

MW-7D	
1,2-DICHLOROETHANE	250,000 ug/L
TRICHLOROETHENE	1500J ug/L
1,1,2-TRICHLOROETHANE	2100J ug/L
1,1,2,2-TETRACHLOROETHANE	2800J ug/L
TDS	2510 mg/L
CHLORIDE	620E mg/L



[illegible]	[illegible]
CHLOROFORM	42J ug/L
1,2-DICHLOROETHANE	31000 ug/L
TRICHLOROETHENE	190J ug/L
1,1,2-TRICHLOROETHANE	290J ug/L
TETRACHLOROETHENE	510J ug/L
ANTIMONY (TOTAL)	11.4J ug/L
ANTIMONY (DISSOLVED)	6.1J ug/L
CADMIUM (TOTAL)	24.9 ug/L
LEAD (TOTAL)	790 ug/L

MW-3S	
1,1-DICHLOROETHENE	6J ug/L
1,2-DICHLOROETHENE	660 ug/L
1,2-DICHLOROETHANE	190J ug/L
TRICHLOROETHENE	2400 ug/L
1,1,2-TRICHLOROETHANE	230 ug/L
TETRACHLOROETHENE	35J ug/L
1,1,2,2-TETRACHLOROETHANE	1300 ug/L
LEAD (TOTAL)	21.4 ug/L

LEGEND

- MW-1 SHALLOW MONITORING WELL AND SOIL BORING
- MW-1 DEEP MONITORING WELL
- SB-1 SOIL BORING LOCATION
- SS-1 SURFACE SAMPLING LOCATION
- TP-1 TEST PIT
- SD-1 SUMP SEDIMENT SAMPLING LOCATION
- ST-1 STATIONS
- TREE OR SHRUB
- HYDRANT
- TELEPHONE POLE
- LIGHT POST
- PROPERTY LINE
- ELEVATION CONTOUR IN FT
- FENCE (PROPERTY BOUNDARY)
- FENCE
- RAILROAD
- TREE LINE
- CONCENTRATIONS ABOVE EPA AND/OR NJDEP ARARs

15 0 15 30
1"=30'

SITE

CO–026J

VOCS, WATER QUALITY PARAMETERS, AND INORGANICS ABOVE USEPA AND/OR NJDEP ARARS IN GROUNDWATER - 2ND ROUND OF SAMPLING

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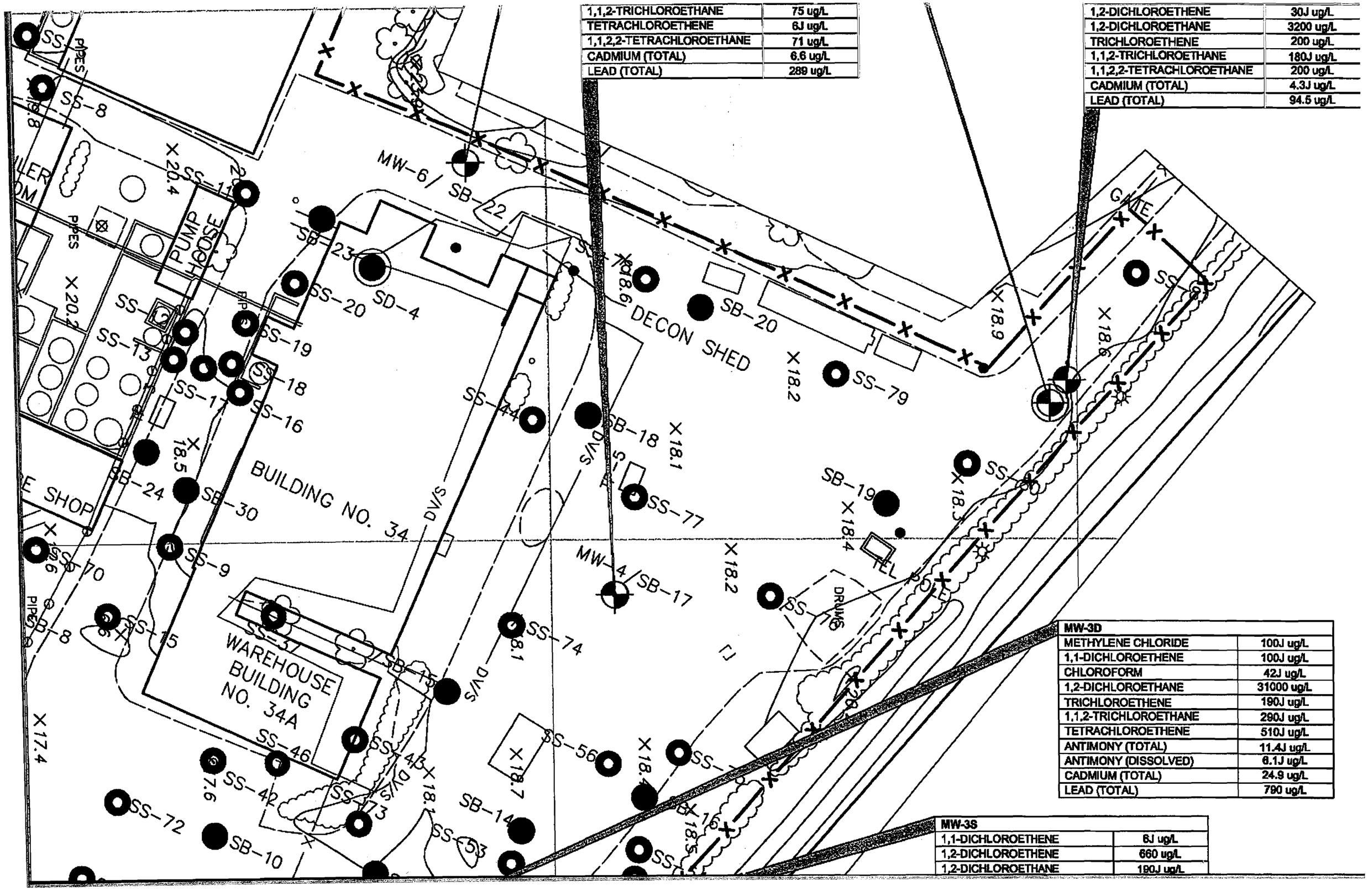
PLATE 12



1,1,2-TRICHLOROETHANE	75 ug/L
TETRACHLOROETHENE	6J ug/L
1,1,2,2-TETRACHLOROETHANE	71 ug/L
CADMIUM (TOTAL)	6.6 ug/L
LEAD (TOTAL)	289 ug/L

1,2-DICHLOROETHENE	30J ug/L
1,2-DICHLOROETHANE	3200 ug/L
TRICHLOROETHENE	200 ug/L
1,1,2-TRICHLOROETHANE	180J ug/L
1,1,2,2-TETRACHLOROETHANE	200 ug/L
CADMIUM (TOTAL)	4.3J ug/L
LEAD (TOTAL)	94.5 ug/L

MW-3D	
METHYLENE CHLORIDE	100J ug/L
1,1-DICHLOROETHENE	100J ug/L
CHLOROFORM	42J ug/L
1,2-DICHLOROETHANE	31000 ug/L
TRICHLOROETHENE	190J ug/L
1,1,2-TRICHLOROETHANE	290J ug/L
TETRACHLOROETHENE	510J ug/L
ANTIMONY (TOTAL)	11.4J ug/L
ANTIMONY (DISSOLVED)	6.1J ug/L
CADMIUM (TOTAL)	24.9 ug/L
LEAD (TOTAL)	790 ug/L

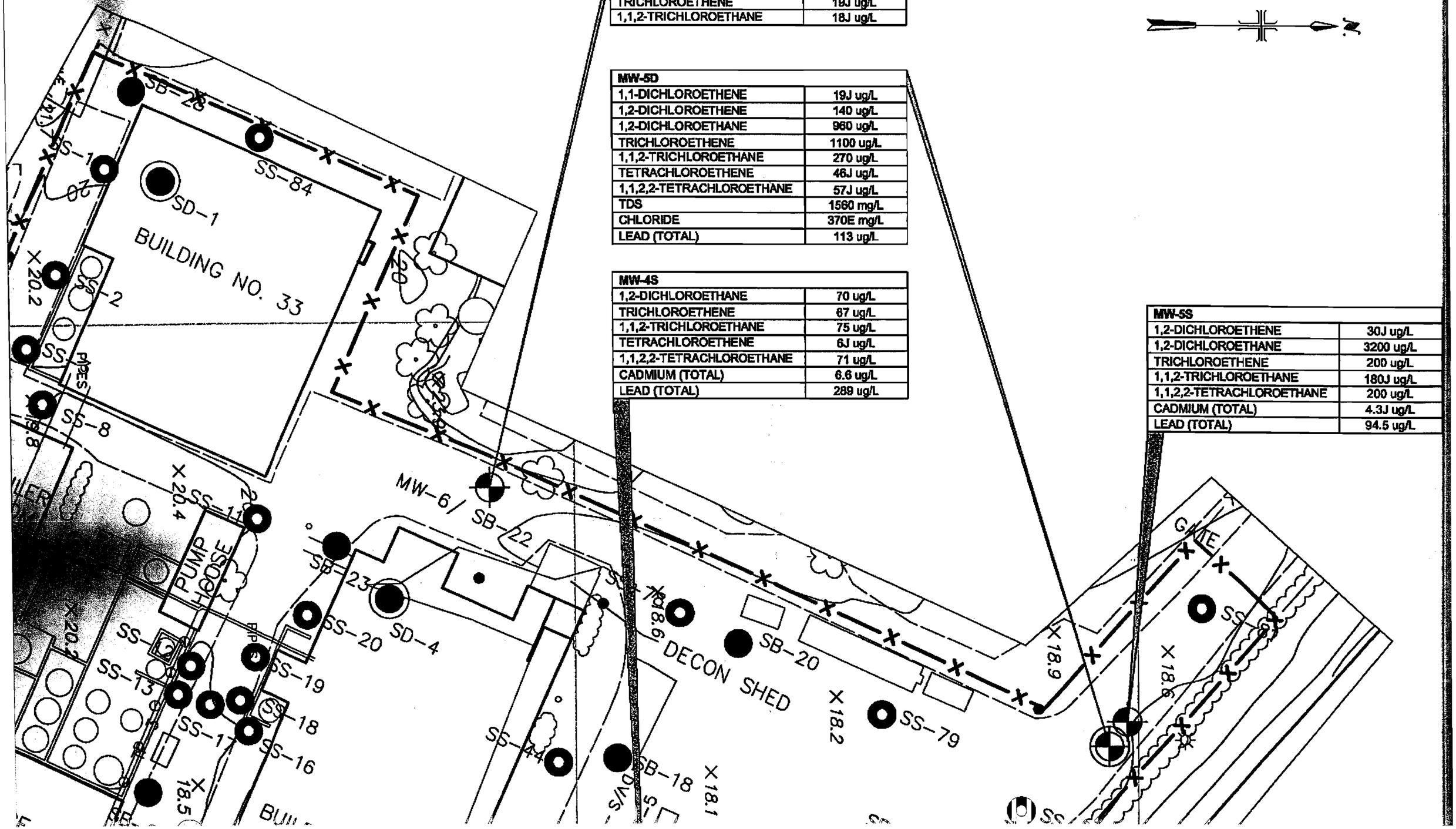
MW-3S	
1,1-DICHLOROETHENE	6J ug/L
1,2-DICHLOROETHENE	660 ug/L
1,2-DICHLOROETHANE	190J ug/L

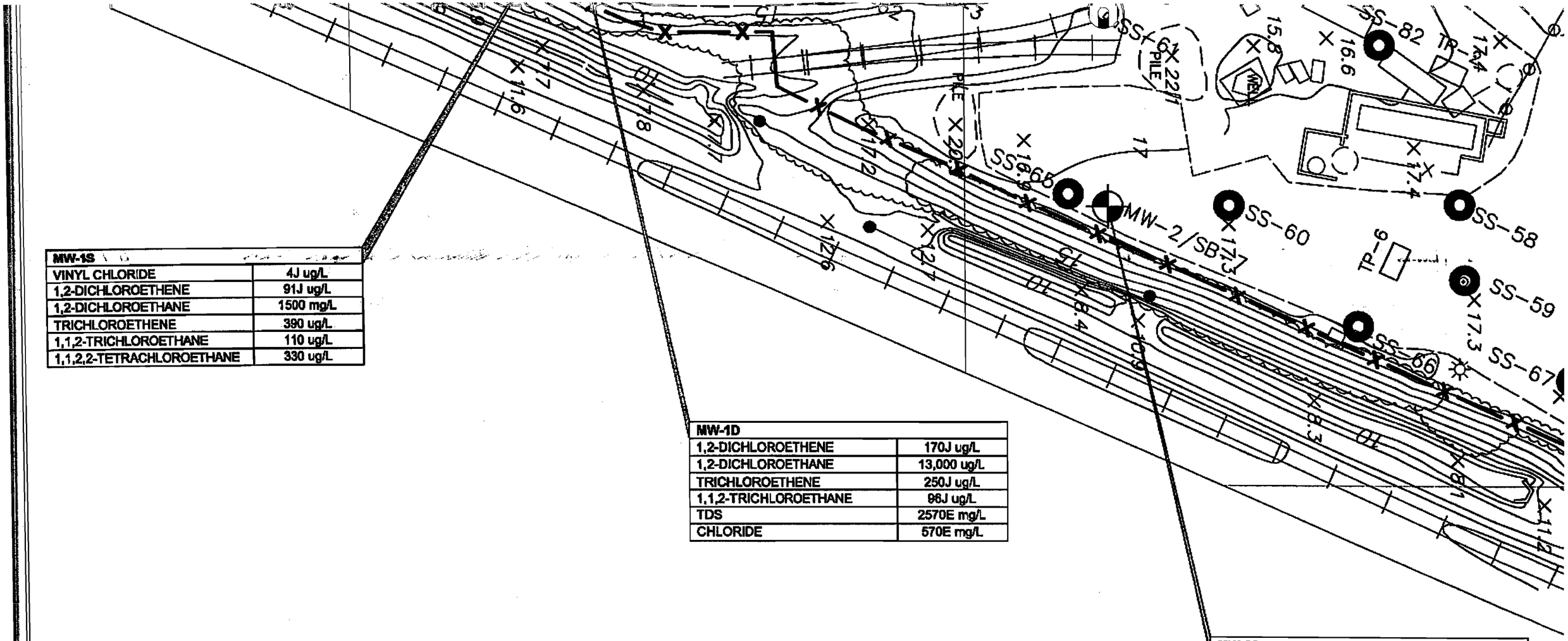
MW-6S	
1,2-DICHLOROETHANE	2200 ug/L
TRICHLOROETHENE	19J ug/L
1,1,2-TRICHLOROETHANE	18J ug/L

MW-5D	
1,1-DICHLOROETHENE	19J ug/L
1,2-DICHLOROETHENE	140 ug/L
1,2-DICHLOROETHANE	960 ug/L
TRICHLOROETHENE	1100 ug/L
1,1,2-TRICHLOROETHANE	270 ug/L
TETRACHLOROETHENE	46J ug/L
1,1,2,2-TETRACHLOROETHANE	57J ug/L
TDS	1560 mg/L
CHLORIDE	370E mg/L
LEAD (TOTAL)	113 ug/L

MW-4S	
1,2-DICHLOROETHANE	70 ug/L
TRICHLOROETHENE	67 ug/L
1,1,2-TRICHLOROETHANE	75 ug/L
TETRACHLOROETHENE	6J ug/L
1,1,2,2-TETRACHLOROETHANE	71 ug/L
CADMIUM (TOTAL)	6.6 ug/L
LEAD (TOTAL)	289 ug/L

MW-5S	
1,2-DICHLOROETHENE	30J ug/L
1,2-DICHLOROETHANE	3200 ug/L
TRICHLOROETHENE	200 ug/L
1,1,2-TRICHLOROETHANE	180J ug/L
1,1,2,2-TETRACHLOROETHANE	200 ug/L
CADMIUM (TOTAL)	4.3J ug/L
LEAD (TOTAL)	94.5 ug/L





MW-1S	
VINYL CHLORIDE	4J ug/L
1,2-DICHLOROETHENE	91J ug/L
1,2-DICHLOROETHANE	1500 mg/L
TRICHLOROETHENE	390 ug/L
1,1,2-TRICHLOROETHANE	110 ug/L
1,1,2,2-TETRACHLOROETHANE	330 ug/L

MW-1D	
1,2-DICHLOROETHENE	170J ug/L
1,2-DICHLOROETHANE	13,000 ug/L
TRICHLOROETHENE	250J ug/L
1,1,2-TRICHLOROETHANE	96J ug/L
TDS	2570E mg/L
CHLORIDE	570E mg/L

MW-2S	
1,1-DICHLOROETHENE	5J ug/L
1,2-DICHLOROETHENE	120 ug/L
1,2-DICHLOROETHANE	440 ug/L
TRICHLOROETHENE	1300 ug/L
1,1,2-TRICHLOROETHANE	450 ug/L
TETRACHLOROETHENE	20J ug/L
1,1,2,2-TETRACHLOROETHANE	1400 ug/L
SULFATE	6200 mg/L

MALCOLM PIRNIE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

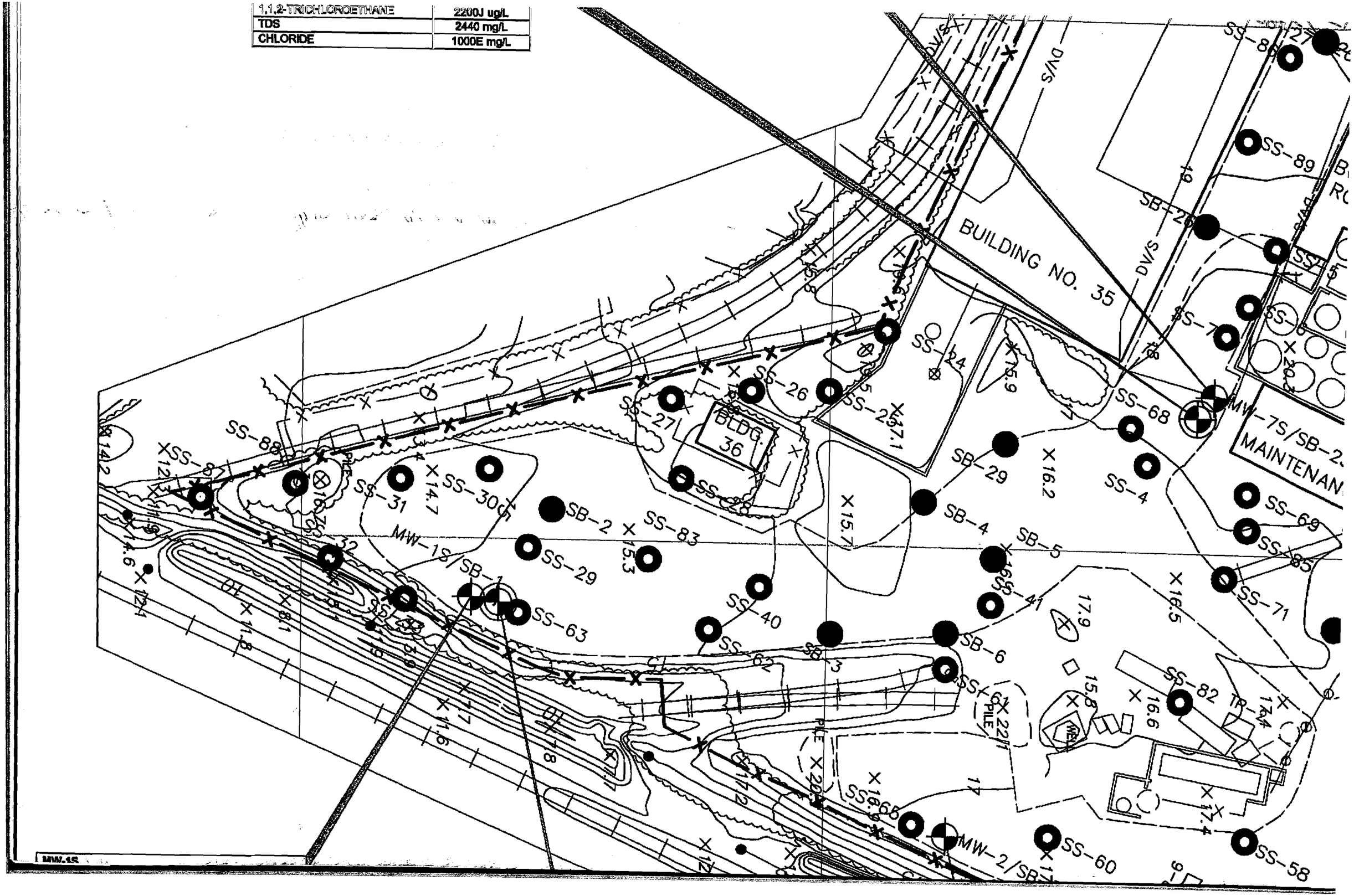
FW

WHITE CHEMICAL CORPORATION SUPERFUND
NEWARK, NEW JERSEY

USEPA RAC II PROGRAM

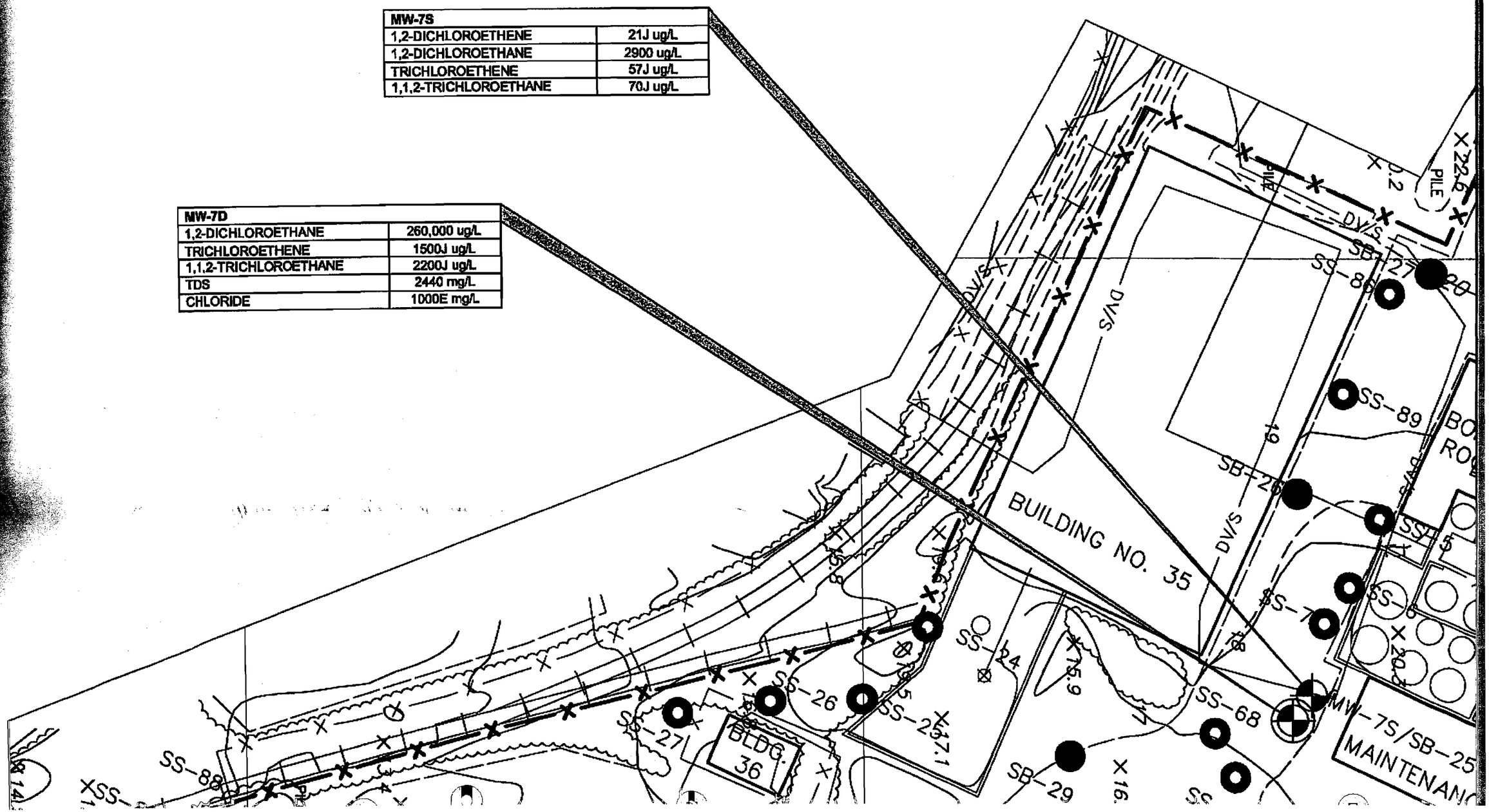
CONTRACT NO. 68-W-98-214; W.A. NO. 027-RI

1,1,2-TRICHLOROETHANE	2200J ug/L
TDS	2440 mg/L
CHLORIDE	1000E mg/L



MW-7S	
1,2-DICHLOROETHENE	21J ug/L
1,2-DICHLOROETHANE	2900 ug/L
TRICHLOROETHENE	57J ug/L
1,1,2-TRICHLOROETHANE	70J ug/L

MW-7D	
1,2-DICHLOROETHANE	260,000 ug/L
TRICHLOROETHENE	1500J ug/L
1,1,2-TRICHLOROETHANE	2200J ug/L
TDS	2440 mg/L
CHLORIDE	1000E mg/L



4/3/97
10:30 A.M.

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW JERSEY

UNITED STATES OF AMERICA,

Plaintiff,

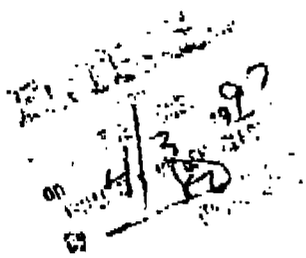
v.

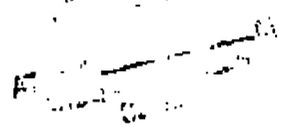
MONSANTO COMPANY
PPG INDUSTRIES, INC. AND
RHONE-POULENC, INC.,

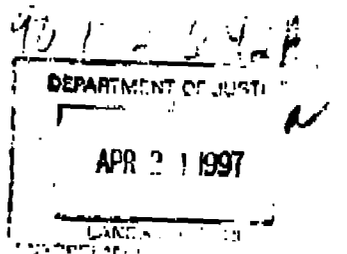
Defendants.

Civil Action No. 97-116 (DRD)

CONSENT DECREE







P.02

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I. BACKGROUND

A. From 1983 to 1990 White Chemical Corporation, operated a manufacturing facility at the White Chemical Corporation Superfund Site in Newark, Essex County, New Jersey ("the Site"), where it disposed of hazardous substances which were released into the environment. The hazardous substances disposed of at the Site were allegedly generated by a number of companies, including Monsanto Company, PPG Industries, Inc., and Rhone-Poulenc, Inc ("Settling Defendants").

B. In 1990, the New Jersey Department of Environmental Protection notified the United States Environmental Protection Agency ("EPA"), Region II that hazardous substances were disposed of at the Site. In response to a release or a substantial threat of a release of hazardous substances, EPA, Region II initiated a removal action at the Site in September 1990, performing stabilization activities. In June 1991, EPA, Region II completed a focused feasibility study documenting the presence of hazardous substances at the Site stored in drums and tanks and identifying alternative remedies for a remedial response.

C. EPA, Region II placed the Site on the National Priorities List on September 25, 1991, and issued a Record of Decision ("ROD") selecting an interim remedy for the Site on September 26, 1991. The selected remedy included off-Site treatment, recycling or disposal of contaminated material; decontamination, off-Site disposal or recycling of empty drums and small containers; and on-Site decontamination of tanks and process piping. EPA, Region II initiated the remedial action on September 27, 1991.

D. On March 31, 1992, EPA, Region II issued Administrative Order No. II CERCLA-20103 ("Order"), pursuant to Section 106(a) of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §9606(a), as amended ("CERCLA"), to the Settling Defendants and eight other potentially responsible parties ("Respondents"). EPA, Region II amended the Order on June 4, 1992. The Order, as amended, directed the Respondents to complete the remedial action then being performed by EPA.

E. The Settling Defendants satisfactorily complied, completing the work required by the Order, as amended, on March 31, 1993. On May 3, 1993, pursuant to Section 106(b) of CERCLA, 42 U.S.C. §9606(b, each Settling Defendant filed a petition, CERCLA 106(b) Petition Nos. 94-16, 94-17 and 94-18 ("Petitions") with EPA for reimbursement of its share of total response costs from the EPA Hazardous Substance Superfund. The Petitions are pending before the EPA Environmental Appeals Board.

F. The United States of America ("United States"), on behalf of the Administrator of EPA, will lodge this Consent

Decree with this Court and contemporaneously file a complaint in this matter pursuant to Section 107 of CERCLA, 42 U.S.C. § 9607, against the Settling Defendants seeking reimbursement of response costs incurred and to be incurred for response actions taken at or in connection with the release or threatened release of hazardous substances at the Site.

G. The Settling Defendants do not admit any liability or facts to Plaintiff arising out of the transactions or occurrences alleged in the complaint related, directly or indirectly to the Site.

H. The United States has determined that settlement of this matter in consideration of payment of response costs by the Settling Defendants and withdrawal of the Petitions, as provided by this Consent Decree, is fair, reasonable, and appropriate.

I. The United States and Settling Defendants agree, and this Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith, that settlement of this matter will avoid prolonged and complicated litigation between the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

THEREFORE, with the consent of the Parties to this Decree, it is ORDERED, ADJUDGED, AND DECREED:

II. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1345 and 42 U.S.C. §§ 9607 and 9613(b) and also has personal jurisdiction over the Settling Defendants. The Settling Defendants consent to and shall not challenge entry of this Consent Decree or this Court's jurisdiction to enter and enforce this Consent Decree.

III. PARTIES BOUND

2. This Consent Decree is binding upon the United States and upon Settling Defendants and their successors and assigns. Any change in ownership or corporate or other legal status, including but not limited to, any transfer of assets or real or personal property, shall in no way alter the status or responsibilities of the Settling Defendants under this Consent Decree.

IV. DEFINITIONS

3. Unless otherwise expressly provided herein, terms used in this Consent Decree which are defined in CERCLA or in

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regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Consent Decree or in any appendix attached hereto, the following definitions shall apply:

a. "CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9601, et seq.

b. "Consent Decree" shall mean this Consent Decree and all appendices attached hereto. In the event of conflict between this Consent Decree and any appendix, the Consent Decree shall control.

c. "Day" shall mean a calendar day. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business of the next working day.

d. "DOJ" shall mean the United States Department of Justice and any successor departments, agencies or instrumentalities of the United States.

e. "EPA" shall mean the United States Environmental Protection Agency and any successor departments, agencies or instrumentalities of the United States.

f. "EPA Hazardous Substance Superfund" shall mean the Hazardous Substance Superfund established by the Internal Revenue Code, 26 U.S.C. § 9507.

g. "Interest" shall mean interest at the current rate specified for interest on investments of the Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a).

h. "Paragraph" shall mean a portion of this Consent Decree identified by an arabic numeral or an upper or lower case letter.

i. "Parties" shall mean the United States and the Settling Defendants.

j. "Petitions" shall mean CERCLA 106(b) Petition Nos. 94-16, 94-17 and 94-18 filed with the EPA Environmental Appeals Board on May 3, 1993, by the Settling Defendants for reimbursement of response costs incurred at the Site pursuant to Section 106(b) of CERCLA, 42 U.S.C. §9606(b).

k. "Plaintiff" shall mean the United States

l. "Response Costs" shall mean all costs recoverable in an action under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), including but not limited to any direct and indirect costs,

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removal and/or remedial costs, together with accrued interest, that the United States or any other person has incurred, is incurring and/or will incur in response to the release or threatened release of hazardous substances at or connected with the Site.

m. "Section" shall mean a portion of this Consent Decree identified by a roman numeral.

n. "Settling Defendants" shall mean Monsanto Company, PPG Industries, Inc., and Rhone-Poulenc, Inc.

o. "Site" shall mean the White Chemical Corporation Superfund Site, encompassing approximately 5.1 acres, identified as Block 3782, Lot 107, on the tax map of Essex County, New Jersey and located at 660 Frelinghuysen Avenue, Essex County, Newark, New Jersey.

p. "United States" shall mean the United States of America, including it departments, agencies and instrumentalities.

V. REIMBURSEMENT OF RESPONSE COSTS

4. Payment of Response Costs to the EPA Hazardous Substance Superfund. Within 30 days of entry of this Consent Decree, Settling Defendants shall pay $600,000 to the EPA Hazardous Substance Superfund in settlement of Response Costs as defined herein. Payment shall be made by FedWire Electronic Funds Transfer ("EFT") to the U.S. Department of Justice account in accordance with current EFT procedures, referencing the United States Attorney's Office ("USAO") File Number _____, the EPA Region and Site Spill ID Number 02-6J, and DOJ Case Number 90-11-2-893. Payment shall be made in accordance with instructions provided to Settling Defendants by the Financial Litigation Unit of the USAO in the District of New Jersey following lodging of the Consent Decree.. Any payments received by the Department of Justice after 4:00 p.m. Eastern Time shall be credited on the next business day. The total amount to be paid pursuant to this Consent Decree, $600,000, shall be deposited in the White Chemical Corporation Superfund Site Special Account within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the Site. Any balance remaining in the White Chemical Corporation Superfund Site Special Account shall be transferred by EPA to the EPA Hazardous Substance Superfund. Settling Defendants shall send notice to EPA and DOJ that payment has been made in accordance with Section XI (Notices and Submissions) and to:

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Chief, Financial Management Branch
U.S. Environmental Protection Agency
Region II
290 Broadway
New York, NY 10007-1866

VI. FAILURE TO COMPLY WITH REQUIREMENTS OF CONSENT DECREE

5. Interest on Late Payments. In the event that any payment required by Section V (Reimbursement of Response Costs) or Section VI, Paragraph 6 (Stipulated Penalty), is not received when due, Interest shall continue to accrue on the unpaid balance through the date of payment.

6. Stipulated Penalty.

a. If any amounts due to EPA under this Consent Decree are not paid by the required date, Settling Defendants shall pay to EPA as a stipulated penalty, in addition to the Interest required by Paragraph 5, $1500 per violation per day.

b. If Settling Defendants do not withdraw the Petitions as required by Section VIII, Settling Defendants shall pay to EPA, as a stipulated penalty, $1500 per violation per day of such noncompliance.

c. If Settling Defendants do not comply with Section X (Retention of Records), Settling Defendants shall pay to EPA, as a stipulated penalty $750 for each act of non-compliance.

d. Stipulated penalties are due and payable within 30 days of the date of the demand for payment of the penalties by EPA. All payments to EPA under this Paragraph shall be made by certified or cashier's check made payable to "EPA Hazardous Substance Superfund" and shall be sent to:

EPA Region II
Attn: Superfund Accounting
P.O. Box 360188M
Pittsburgh, Pennsylvania 15251

All payments shall indicate that the payment is for stipulated penalties and shall reference the name and address of the party making payment, the EPA Region and Site Spill ID Number 02-6J, USAO File Number _____, and DOJ Case Number 90-11-2-893. Copies of checks paid pursuant to this Paragraph, and any accompanying transmittal letters, shall be sent to EPA and DOJ as provided in Section XI (Notices and Submissions) and to:

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Chief, Financial Management Branch
U.S. Environmental Protection Agency
Region II
290 Broadway
New York, NY 10007-1866

c. Penalties shall accrue as provided in this Paragraph regardless of whether EPA has notified Settling Defendants of the violation or made a demand for payment, but need only be paid upon demand. All penalties shall begin to accrue on the day a violation occurs, and shall continue to accrue through the final day of correction of the noncompliance or completion of the activity. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Consent Decree.

7. If the United States brings an action to enforce this Consent Decree and if the United States is the prevailing party in any such action, Settling Defendants shall reimburse the United States for all costs of such action, including but not limited to costs of attorney time.

8. Payments made under Paragraphs 5-7 shall be in addition to any other remedies or sanctions available to Plaintiff by virtue of Settling Defendants' failure to comply with the requirements of this Consent Decree.

9. The obligations of Settling Defendants to pay amounts owed the United States under this Consent Decree are joint and several. In the event of the failure of any one or more Settling Defendants to make the payments required under this Consent Decree, the remaining Settling Defendants shall be responsible for such payments.

10. Notwithstanding any other provision of this Section, the United States may, in its unreviewable discretion, waive payment of any portion of the stipulated penalties that have accrued pursuant to this Consent Decree.

VII. COVENANT NOT TO SUE BY PLAINTIFF

11. Covenant Not to Sue by United States. Except as specifically provided in Paragraph 12 (Reservation of Rights by United States), the United States covenants not to sue Settling Defendants pursuant to Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), to recover Response Costs. This covenant not to sue shall take effect upon receipt by EPA of all payments required by Section V, Paragraph 4 (Payment of Response Costs to the United States) and, if applicable, Section VI, Paragraphs 5 (Interest on Late Payments) and 6(a) (Stipulated Penalty for Late Payment), and Section VIII, Paragraph 15 (Withdrawal of Petitions). This covenant not to sue is conditioned upon the satisfactory

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performance by Settling Defendants of their obligations under this Consent Decree. This covenant not to sue extends only to Settling Defendants and does not extend to any other person.

12. A. General Reservation of Rights by United States.

The covenant not to sue set forth in Paragraph 11 does not pertain to any matters other than those expressly specified therein. The United States reserves, and this Consent Decree is without prejudice to, all rights against Settling Defendants with respect to all other matters, including but not limited to:

a. liability for failure of Settling Defendants to meet a requirement of this Consent Decree;

b. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;

c. criminal liability; and

d. liability for costs incurred or to be incurred by the United States that are not Response Costs as defined herein.

B. Specific Reservation of Rights by United States.

If any Settling Defendant has made material misstatements or material omissions in disclosing information to EPA in response to requests for information pursuant to Sections 104(e) of CERCLA, 42 U.S.C. § 9604(e), with respect to the ownership, operation or control of the Site, or to the ownership, possession, generation, treatment, transportation, storage or disposal of a hazardous substance, pollutant or contaminant at or in connection with the Site, then not withstanding any other provisions of this Consent Decree, the United States reserves, pursuant to its authorities under Sections 106 and 107 of CERCLA, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel the Settling Defendant (1) to perform response actions relating to the Site, or (2) to reimburse the United States for additional costs of response actions.

VIII. COVENANTS BY SETTLING DEFENDANTS

13. Settling Defendants covenant not to sue and agree not to assert any claims or causes of action against the United States, or its contractors or employees, with respect to Response Costs or this Consent Decree, including but not limited to:

a. any direct or indirect claim for reimbursement from

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the Hazardous Substance Superfund based on Sections 106(b)(2), 107, 111, 112, or 113 of CERCLA, 42 U.S.C. §§ 9606(b)(2), 9607, 9611, 9612, or 9613, or any other provision of law;

b. any claim arising out of response actions at the Site for which the Response Costs were incurred; and

c. any claim against the United States pursuant to Sections 107 and 113 of CERCLA, 42 U.S.C. §§ 9607 and 9613, relating to Response Costs.

d. With respect to claims asserted in the action filed in the Superior Court of New Jersey, captioned Paula A. Cammarata, et al. vs. White Chemical Corporation, et al., Docket No. L-01458092, or any other action filed by employees of the United States regarding the Site, the Settling Defendants reserve, and this Consent Decree is without prejudice to, claims against the United States, subject to the provisions of Chapter 171 of Title 28 of the United States Code, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States while acting within the scope of his office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, any such claim shall not include a claim for any damages caused, in whole or in part, by the act or omission of any person, including any contractor, who is not a federal employee as that term is defined in 28 U.S.C. § 2671; nor shall any such claim include a claim based on EPA's selection of response actions, or the oversight or approval of the Settling Defendants' plans or activities. The foregoing applies only to claims which are brought pursuant to any statute other than CERCLA and for which the waiver of sovereign immunity is found in a statute other than CERCLA.

14. Nothing in this Consent Decree shall be deemed to constitute approval or preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. 300.700(d).

15. Settling Defendants covenant to withdraw the Petitions pending before the EPA Environmental Appeals Board within 30 days of entry of this Consent Decree. Settling Defendants further covenant to neither reinstate the Petitions, nor file any claims pursuant to Section 106(b) of CERCLA, 42 U.S.C. § 9606(b), for Response Costs as defined herein.

IX. EFFECT OF SETTLEMENT/CONTRIBUTION PROTECTION

16. Nothing in this Consent Decree shall be construed to create any rights in, or grant any cause of action to, any person

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not a Party to this Consent Decree. Each of the Parties expressly reserves any and all rights (including, but not limited to, any right to contribution), defenses, claims, demands, and causes of action which each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto.

17. The Parties agree, and by entering this Consent Decree this Court finds, that Settling Defendants are entitled, as of the effective date of this Consent Decree, to protection from contribution actions or claims as provided by Section 113(f)(2) of CERCLA, 42 U.S.C. § 9613(f)(2), for "matters addressed" in this Consent Decree. The "matters addressed" in this Consent Decree are Response Costs as defined herein.

18. Each Settling Defendant agrees that, with respect to any suit or claim for contribution brought by it for matters related to this Consent Decree, it will notify EPA and DOJ in writing no later than 60 days prior to the initiation of such suit or claim, except as to the lawsuit previously filed captioned Rhone-Poulenc, Inc., PPG Industries, Inc. and Monsanto Company vs. AZS Corporation, et al., Civil Action No. 93-2185 (MTB). Each Settling Defendant also agrees that, with respect to any suit or claim for contribution brought against it for matters related to this Consent Decree, it will notify EPA and DOJ in writing within 10 days of service of the complaint or claim upon it. In addition, each Settling Defendant shall notify EPA and DOJ within 10 days of service or receipt of any Motion for Summary Judgment, and within 10 days of receipt of any order from a court setting a case for trial, for matters related to this Consent Decree.

19. In any subsequent administrative or judicial proceeding initiated by the United States for injunctive relief, recovery of response costs, or other relief relating to the Site, Settling Defendants shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States in the subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the Covenant Not to Sue by Plaintiff set forth in Section VII.

X. RETENTION OF RECORDS

20. Until 7 years after the entry of this Consent Decree, each Settling Defendant shall preserve and retain all records and documents now in its possession or control, or which come into its possession or control, that relate in any manner to response actions taken at the Site or the liability of any person for response actions conducted and to be conducted at the Site,

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regardless of any corporate retention policy to the contrary, except for those records which were obtained from EPA (the "Excluded Records"). The Excluded Records may be destroyed at any time, provided that the Settling Parties notify EPA and DOJ at least 90 days prior to the destruction of any Excluded Records, and, upon request by EPA or DOJ, said Settling Defendant shall deliver any Excluded Records to EPA.

21. After the conclusion of the document retention period in the preceding paragraph, Settling Defendants shall notify EPA and DOJ at least 90 days prior to the destruction of any such records or documents, and, upon request by EPA or DOJ, Settling Defendants shall deliver any such records or documents to EPA. Settling Defendants may assert that certain documents, records, or other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Settling Defendants assert such a privilege, they shall provide Plaintiff with the following: 1) the title of the document, record, or information; 2) the date of the document, record, or information; 3) the name and title of the author of the document, record, or information; 4) the name and title of each addressee and recipient; 5) a description of the subject of the document, record, or information; and 6) the privilege asserted. If a claim of privilege applies only to a portion of a document, the document shall be provided to Plaintiff in redacted form to mask the privileged information only. Settling Defendants shall retain all records and documents that they claim to be privileged until the United States has had a reasonable opportunity to dispute the privilege claim and any such dispute has been resolved in the Settling Defendants' favor.

22. By signing this Consent Decree, each Settling Defendant certifies individually that, to the best of its knowledge and belief, it has:

a. conducted a thorough, comprehensive, good faith search for documents, and has fully and accurately disclosed to EPA, all material information currently in its possession, or in the possession of its officers, directors, employees, contractors or agents, which relates in any way its ownership, possession, generation, treatment, transportation, storage or disposal of a hazardous substance, pollutant or contaminant at or in connection with the Site;

b. not altered, mutilated, discarded, destroyed or otherwise disposed of any records, documents or other information relating to its potential liability regarding the Site, after notification of potential liability or the filing of a suit against the Settling Defendant regarding the Site; and

c. fully complied with any and all EPA requests for information regarding the Site pursuant to Sections 104(e) of

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CERCLA, 42 U.S.C. § 9604(e).

XI. NOTICES AND SUBMISSIONS

23. Whenever, under the terms of this Consent Decree, notice is required to be given or a document is required to be sent by one party to another, it shall be directed to the individuals at the addresses specified below, unless those individuals or their successors give notice of a change to the other Parties in writing. Written notice as specified herein shall constitute complete satisfaction of any written notice requirement of the Consent Decree with respect to the United States, EPA, DOJ, and Settling Defendants, respectively.

As to the United States:

As to DOJ:

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
Ref: 90-11-2-893.

As to EPA:

Chief, New Jersey Superfund Branch
Office of Regional Counsel
U.S. Environmental Protection Agency
Region II
290 Broadway, 17th Floor
New York, NY 10007-1866
Attention: White Chemical Site Attorney

Chief, Special Projects Branch
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
Region II
290 Broadway, 19th Floor
New York, NY 10007-1866
Attention: White Chemical Site Project Manager
Mega Site Team

As to Settling Defendants:

Brian S. Montag, Esq.
Pitney, Hardin, Kipp & Szuch
200 Campus Drive
Florham Park, NJ 07962-1945

XII. RETENTION OF JURISDICTION

24. This Court shall retain jurisdiction over this matter for the purpose of interpreting and enforcing the terms of this Consent Decree.

XIII. INTEGRATION

25. This Consent Decree constitutes the final, complete and exclusive agreement and understanding among the Parties with respect to the settlement embodied in this Consent Decree. The Parties acknowledge that there are no representations, agreements or understandings relating to the settlement other than those expressly contained in this Consent Decree.

XIV. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

26. This Consent Decree shall be lodged with the Court for a period of not less than 30 days for public notice and comment. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations which indicate that this Consent Decree is inappropriate, improper, or inadequate. Settling Defendants consent to the entry of this Consent Decree without further notice.

27. If for any reason this Court should decline to approve this Consent Decree in the form presented, this agreement is voidable at the sole discretion of any party and the terms of the agreement may not be used as evidence in any subsequent litigation, action or administrative proceeding between the Parties.

XV. EFFECTIVE DATE

28. The effective date of this Consent Decree shall be the date upon which it is entered by the Court.

XVI. SIGNATORIES/SERVICE

29. Each undersigned representative of a Settling Defendant to this Consent Decree and the Assistant Attorney General for the Environment and Natural Resources Division of the United States Department of Justice certifies that he or she is authorized to enter into the terms and conditions of this Consent Decree and to execute and bind legally such Party to this document.

30. Each Settling Defendant hereby agrees not to oppose entry of this Consent Decree by this Court or to challenge any provision of this Consent Decree, unless the United States has notified Settling Defendants in writing that it no longer supports entry of the Consent Decree.

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31. Each Settling Defendant shall identify, on the attached signature page, the name and address of an agent who is authorized to accept service of process by mail on behalf of that Party with respect to all matters arising under or relating to this Consent Decree. Settling Defendants hereby agree to accept service in that manner and to waive the formal service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any applicable local rules of this Court, including but not limited to, service of a summons.

SO ORDERED THIS 3rd DAY OF April, 1997.

William K. Walker

United States District Judge

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THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of United States v. Monsanto, et al. relating to the White Chemical Corporation Superfund Site.

FOR THE UNITED STATES OF AMERICA

Date: 1/7/97

Lois J. Schiffer
Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice
Washington, D.C. 20530

Date: 1/10/97

Henry S. Friedman
Senior Attorney
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611

Faith S. Hochberg
United States Attorney
for the District of New Jersey

Date: 1/13/97

Susan C Cassell
Assistant United States Attorney
District of New Jersey

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THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of United States v. Monsanto, et al. relating to the White Chemical Corporation Superfund Site.

Date: 9/30/96

Jeanne M. Fox
Regional Administrator, Region II
U.S. Environmental Protection Agency
290 Broadway
New York, NY 10007-1866

Date: 9/30/96

Michael J. van Itallie
Assistant Regional Counsel
U.S. Environmental Protection Agency
290 Broadway
New York, NY 10007-1866

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THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Monsanto, et al. relating to the White Chemical Corporation Superfund Site.

For: Monsanto Company
Settling Defendant Name

Date: September 30, 1996

Signature

Michael R. Foresman
Name-Please Type

Director, Remediation Management Group
Title

800 N. Lindbergh Blvd. - F2EA
Address

St. Louis, MO 63167

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Andrew J. Morris, Esq.

Title:

Address: Mayer, Brown & Platt
2000 Pensylvania Avenue, N.W.
Washington, D.C. 20006-1882

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Monsanto, et al. relating to the White Chemical Corporation Superfund Site.

For: PPG Industries, Inc.
Settling Defendant Name

Date: September 30, 1996

Signature

Peter R. Heinze
Name-Please Type

Senior Vice President, Chemicals
Title

One PPG Place - 36 North
Address

Pittsburgh, PA 15272

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Joseph M. Karas

Title: Assistant Counsel

Address: One PPG Place - 39 East
Pittsburgh, PA 15272

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Monsanto, et al. relating to the White Chemical Corporation Superfund Site.

For: RHONE-POULENC INC.
Settling Defendant Name

Date: September 26, 1996

Signature

John M. Iatesta
Name-Please Type

Senior Corporate Counsel and Assistant Secretary
Title

CN 5266
Address

Princeton, NJ 08543-5266

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: George S. Goodridge, Esq.

Title: Senior Environmental Attorney
Rhone-Poulenc Inc.

Address: P. O. Box 12014
2 T. W. Alexander Drive
Research Triangle Park, NC 27709-2014

FILED
2-1-99
WILLIAM T. WALSH, CLERK

HENRY S. FRIEDMAN
RICHARD C. VISEK
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611, Ben Franklin Station
Washington, D.C. 20044
(202) 514-2639
HF-5735
RV-6543

SUSAN CASSELL
Assistant United States Attorney
District of New Jersey
Federal Building, 7th Floor
970 Broad Street
Newark, New Jersey 07102
(973) 645-2847
SC-8081

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW JERSEY

UNITED STATES OF AMERICA, Plaintiff, v. AZS CORPORATION, TOYO SODA (AMERICA), INC., TOSOH CORPORATION, TOSOH AMERICA, INC., AND TOSOH USA, INC. Defendants.	Civil Action No. 99-464 (ORD)

NOTICE OF LODGING OF CONSENT DECREE

Plaintiff, the United States of America, hereby notifies the Court that it is lodging herewith, on the same date it is filing the Complaint herein, a Consent Decree for the recovery of costs incurred at the White Chemical Corporation Superfund Site ("Site") located at 660 Frelinghuysen Avenue, Newark, New Jersey.

This suit was filed pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9601, et seq. This Consent Decree is being lodged with the Court pending solicitation and consideration of public comments.

Consistent with Department of Justice policy, 28 C.F.R. § 50.7, the Department of Justice will publish in the Federal Register a notice of the lodging of this Consent Decree. This publication will initiate a required 30-day comment period. The United States will advise the Court when the public comment period has expired. During the pendency of the public comment period, no action is required of the Court.

After the close of the public comment period, the United States will evaluate any comments received and will move for entry of the Consent Decree, unless the comments disclose facts or considerations which indicate that the proposed Decree is inappropriate, improper or inadequate.

Respectfully submitted,

LOIS J. SCHIFFER
Assistant Attorney General
Environmental and Natural Resources Division

By:
HENRY S. FRIEDMAN
RICHARD C. VISEK
Environmental Enforcement Section
Environmental and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
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UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW JERSEY

UNITED STATES OF AMERICA, Plaintiff, v. AZS CORPORATION, TOYO SODA (AMERICA), INC., TOSOH CORPORATION, TOSOH AMERICA, INC., AND TOSOH USA, INC. Defendants.	Civil Action No. 99-464 (DRA)

COMPLAINT

The United States of America, by authority of the Attorney General of the United States and on behalf of the Administrator of the United States Environmental Protection Agency ("EPA"), alleges as follows:

Statement of Case

1. This is a civil action brought pursuant to Section 107(a) of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9607(a), as amended. By this action, the United States seeks to recover costs incurred and to be incurred by the United States in response to the release or threatened release of hazardous substances at or from a facility known as the White Chemical Corporation Superfund Site ("White Chemical Site" or "Site"), located in Newark, Essex County, New Jersey.

Jurisdiction and Venue

2. This Court has jurisdiction over this action pursuant to Sections 107(a) and 113(b) of CERCLA, 42 U.S.C. §§ 9607(a) and 9613(b), and 28 U.S.C. §§ 1331, 1345, and 1355.

3. Pursuant to Section 113(b) of CERCLA, 42 U.S.C. § 9613(b), and 28 U.S.C. § 1391(b) and (c), venue is proper in this district because the releases or threatened releases of hazardous substances that give rise to this claim occurred in this district.

The Defendants

4. Defendant AZS Corporation ("AZS") is a corporation organized and existing under the laws of the State of Georgia. Its principal place of business is located at 1100 Circle 75 Parkway, Atlanta, Georgia 30339. At times relevant to this action, AZS was the owner of the White Chemical Site. Since

1980, AZS has been a wholly-owned subsidiary of Toyo Soda (America), Inc.

5. Defendant Toyo Soda (America), Inc. ("Toyo Soda (America)"), is a corporation organized and existing under the laws of the State of Delaware. Its principal place of business is located at 1100 Circle 75 Parkway, Atlanta, Georgia 30339. Toyo Soda (America) was formed by Tosoh Corporation for the purpose of purchasing 100% of the stock of AZS Corporation in 1980. Toyo Soda (America) is a holding company for AZS. Toyo Soda (America) conducts no business of its own. Since its formation, Toyo Soda (America) has been a wholly-owned subsidiary of Tosoh Corporation.

6. Defendant Tosoh Corporation ("Tosoh") is a Japanese Corporation. It was formerly Toyo Soda Manufacturing Co., Ltd. Tosoh's principal place of business is located at 1-7-7, Akasaka, Minato-Ku, Tokyo, Japan. Tosoh is engaged in the manufacturing of chemical products and the distribution of chemicals and chemical products in the United States. The Tosoh group of companies in the United States includes AZS, Toyo Soda (America), Tosoh America, Inc., and Tosoh USA, Inc.

7. Tosoh America, Inc. ("Tosoh America") is a corporation organized and existing under the laws of the State of Delaware. Tosoh America was incorporated in 1989. Its principal place of business is located at 3600 Gantz Road, Grove City, Ohio 43123. Prior to 1998, its principal place of business was located at 1100 Circle 75 Parkway, Atlanta, Georgia 30339.

Tosoh America is a wholly-owned subsidiary of Tosoh. Tosoh America is a holding company for thirteen U.S.-based subsidiaries and affiliates of Tosoh, including Tosoh USA, Inc.

8. Tosoh USA, Inc. ("Tosoh USA") is a corporation organized and existing under the laws of the State of Delaware. Its principal place of business is located at 1100 Circle 75 Parkway, Atlanta, Georgia 30339. Tosoh USA originally was incorporated in the State of New York in 1979 under the name Toyo Soda USA, Inc. It changed its name to Tosoh USA in or about September 1987. Tosoh USA was established to market the products of Tosoh and other Tosoh entities in the United States.

Site Ownership & Operations

9. The White Chemical Site consists of approximately 4.4 acres located at 660 Frelinghuysen Avenue, Newark, New Jersey, designated as Block 3782, Lot 109 on the City of Newark Tax Map.

10. By deed dated August 28, 1975, Lancaster Chemical Co. ("Lancaster Chemical"), a division of AZS, acquired the Site. Lancaster Chemical manufactured and stored chemical products at the Site until 1982.

11. By lease dated September 27, 1982, AZS leased the Site for five years to the White Chemical Corporation ("White Chemical"). At or about the time of the initial lease, AZS advised the owner of White Chemical, James White, that it was possible there was some existing environmental contamination at the Site.

12. AZS renewed White Chemical's lease at the Site for an additional five-year period in 1987.

13. From 1982-1990, White Chemical manufactured, formulated, and stored chemicals and chemical products at the Site. Chemicals used and/or stored by White Chemical included, inter alia: acid chlorides, alkyl bromides, mineral acids, and flame retardants.

14. Upon information and belief, White Chemical stored and disposed of at the Site wastes containing "hazardous substances," within the meaning of Section 107 of CERCLA, 42 U.S.C. § 9601(14). Such hazardous substances were stored and disposed of in drums and containers, many of which were deteriorated.

Releases & Response Actions

15. In 1989, the New Jersey Department of Environmental Protection ("NJDEP") inspected the Site and found violations of New Jersey environmental laws, including the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 et seq. Thereafter, in October 1989, White Chemical filed for bankruptcy protection.

16. In 1990, the NJDEP issued Notices of Violation to White Chemical and AZS in connection with the environmental problems at the Site. The NJDEP also issued a Directive and Notice to Insurer to, inter alia, AZS, Lancaster Chemical, and Tosoh USA. The Directive instructed these entities to secure the Site and remove chemicals and chemical containers.

17. On August 24, 1990, NJDEP requested EPA to undertake a CERCLA removal action at the Site.

18. In September 1990, EPA conducted a preliminary assessment of the Site and issued an Action Memorandum authorizing a removal action to secure and stabilize the Site. In addition, the Agency for Toxic Substances and Disease Registry ("ATSDR") issued a health consultation, finding that the uncontrolled storage of hazardous substances at the Site coupled with on-going releases posed an imminent and substantial health and safety threat to nearby residents.

19. In October 1990, EPA initiated a removal action at the Site, pursuant to Section 104(a) of CERCLA, 42 U.S.C. § 9604(a), to stabilize over 10,000 drums and containers, many of which were leaking, deteriorating and/or fuming. Pursuant to its authority under Section 104(b) of CERCLA, 42 U.S.C. § 9604(b), EPA prepared a Focused Feasibility Study ("FFS") based on the information collected from the removal action.

20. The FFS documented the presence of substances considered hazardous within the meaning of Section 101(14) of CERCLA, 42, U.S.C. § 9601(14). Such substances were found in drums and containers and releases into the air and soil. The substances were of the same kind as those used and generated by White Chemical's operations.

21. On September 25, 1991, EPA listed the White Chemical Site on the National Priorities List, 40 C.F.R. Part 300, Appendix B, which is a list of hazardous waste sites

nationwide that pose the greatest threat to public health, public welfare and the environment. The National Priorities List is established pursuant to Section 105(a) of CERCLA, 42 U.S.C. § 9605(a).

22. Based on the results of the FFS, on September 26, 1991, EPA issued a Record of Decision ("ROD") which selected an interim remedial action ("Remedial Action"). The ROD included off-Site treatment, recycling or disposal of the contaminated material found in the drums and containers; decontamination, off-Site disposal or recycling of empty drums and small containers; and on-Site decontamination of tanks and process piping. In addition, the ROD called for a remedial investigation and feasibility study ("RI/FS") to determine the extent of soil and groundwater contamination.

23. Pursuant to the ROD, EPA initiated and performed the Remedial Action at the Site from September 1991 through October 1992. The Remedial Action included off-Site treatment, recycling or disposal of contaminated material; decontamination, off-Site disposal or recycling of empty drums and small containers; and on-Site decontamination of tanks and process piping.

24. On March 31, 1992, EPA issued an administrative order ("Order") requiring AZS, White Chemical, James White, and eight generators (collectively "Respondents") to complete the Remedial Action then being performed by EPA. The Order required the Respondents to undertake a portion of the Remedial Action

required by the ROD, including decontamination, off-Site disposal and recycling of empty drums and small containers, and on-Site decontamination of tanks and process piping. Of the eleven Respondents, only three complied, completing the work required by the Order on March 31, 1993. AZS, which was the Site owner, was not one of the Respondents that complied with the Order.

25. In 1996, the City of Newark acquired the Site through foreclosure after AZS failed to pay property taxes.

26. EPA has initiated a follow-up RI/FS, which was provided for by the ROD and is to examine soil and groundwater contamination at the Site. It is expected that this RI/FS will result in a follow-up ROD.

27. The United States already has incurred "response costs," as defined in Sections 101(25) and 107(a) of CERCLA, 42 U.S.C. §§ 9601(25) and 9607(a). In 1997, EPA filed suit against three of the eleven Respondents to recover response costs related to the Site. See United States v. Monsanto Company, PPG Industries, Inc., and Rhone-Poulenc, Inc., Civil Action No. 97-110 (DRD) (D.N.J. Jan. 13, 1997). This suit was resolved by entry of a consent decree on April 3, 1997. There remains over $15 million in unrecovered past response costs. The United States also is incurring and will incur additional response costs.

28. To date, neither AZS nor any of the other Tosoh entities has reimbursed EPA for any of the response costs incurred by EPA relating to the Site.

AZS' Inter-relationship with Tosoh and Other Tosoh Entities

29. At times relevant to this action, AZS has been the alter ego or mere instrumentality of Tosoh and one or more of its entities, including Toyo Soda (America). Tosoh has used Toyo Soda (America), Tosoh America and Tosoh USA as means of exercising control over, directing, and influencing the corporate actions and activities of AZS. But for a thin corporate facade, AZS is indistinguishable from Tosoh, Toyo Soda (America), Tosoh America, and/or Tosoh USA. The entities are so interwoven that the lines of corporate separateness are hopelessly blurred and rendered meaningless, as evidenced by, inter alia, the facts described in paragraphs 30-40.

30. AZS has shared office space and telephone lines with other Tosoh entities, including Toyo Soda (America), Tosoh America, and Tosoh USA.

31. There has been a commonality of officers, directors and employees between AZS and other Tosoh entities, including Tosoh, Toyo Soda (America), Tosoh America, and Tosoh USA.

32. Management, administrative and clerical functions of AZS, including maintaining business records, have been carried out by other Tosoh entities, including Toyo Soda (America) and Tosoh USA.

33. Employees, directors and officials of AZS and the other Tosoh entities have operated as though AZS and one or more

of the other Tosoh entities, including Tosoh USA, are the same company.

34. AZS has filed consolidated tax returns and shared consolidated financial statements with Toyo Soda (America).

35. AZS has been used to conduct or broker transactions for the benefit of Tosoh and other Tosoh entities, including Tosoh USA.

36. Tosoh and Toyo Soda (America) have guaranteed loans to AZS. In addition, Tosoh, Toyo Soda (America), Tosoh America, and Tosoh USA have provided sizable financial support to AZS through loans and transfers. Loans for substantial sums have been unsecured, not documented by formal loan agreements, and/or provided with no requirement that interest be paid.

37. With knowledge of AZS' actual and potential environmental liabilities, Tosoh oversaw the liquidation of substantially all of AZS' assets from 1985-1988. In connection with this liquidation effort, funds and assets of AZS, as well as proceeds from the sale of AZS assets, were transferred to and between Tosoh and its entities, including Toyo Soda (America) and Tosoh USA.

38. In connection with the liquidation, an unsuccessful effort was made by AZS and Tosoh officials to sell the White Chemical Site. In addition, substantially all of AZS' assets at facilities in Atlanta, Georgia and Lakeland, Florida were sold. In order to conclude the sale of the Atlanta and Lakeland facilities, Tosoh provided guarantees to pay for costs

related to environmental clean-up activities. The sale of the Florida facility also included a "non-competition" agreement, which applied to the so-called "Tosoh Companies." These were defined as: AZS, Toyo Soda (America), Tosoh USA, and Tosoh -- "the ultimate parent" of the other Tosoh companies.

39. In or about January 1988, AZS and Toyo Soda (America) became dormant. Since that time, AZS and Toyo Soda (America) have not carried on any income-producing business activities and have been essentially insolvent. The two entities' working capital requirements have been funded primarily via transfers from Tosoh.

40. In 1989, Tosoh consolidated all of its United States-based entities under Tosoh America, except for AZS and Toyo Soda (America). Through this restructuring, Tosoh attempted to insulate Tosoh and its other entities from the liabilities of AZS and Toyo Soda (America).

Claim for Relief

41. The facts and allegations set forth in paragraphs 1 through 40 are incorporated by reference as if fully set forth below.

42. The White Chemical Site is a "facility" within the meaning of Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

43. There have been "releases" and "threatened releases" of "hazardous substances" within the meaning of Sections 101(14), 101(22), and 107(a) of CERCLA, 42 U.S.C.

§§ 9601(14), 9601(22), and 9607(a), at or from the White Chemical Site.

44. As a result of the release or threatened release of hazardous substances at and from the White Chemical Site, the United States has incurred and will incur "response costs" as defined in Sections 101(25) and 107(a) of CERCLA, 42 U.S.C. §§ 9601(25) and 9607(a), for actions taken in response to the release or threatened release of hazardous substances at and from the White Chemical Site.

45. The response actions taken by the United States and the resulting response costs incurred by the United States in connection with the White Chemical Site are not inconsistent with the National Contingency Plan, as set forth in 40 C.F.R. Part 300.

46. Each Defendant is a "person" within the meaning of Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

47. AZS is liable, pursuant to Section 107(a)(2) of CERCLA, 42 U.S.C. § 9607(a)(2), as a person who owned a vessel or facility, i.e., the White Chemical Site, from which there was a release or threatened release of a hazardous substance which caused the incurrence of response costs.

48. By reason of their control and domination over AZS, Defendants Tosoh, Toyo Soda (America), Tosoh America, and Tosoh USA are each liable, pursuant to Section 107(a)(2) of CERCLA, 42 U.S.C. § 9607(a)(2), as the alter ego of a person, i.e., AZS, who owned a vessel or facility, i.e., the White

Chemical Site, from which there was a release or threatened release of a hazardous substance which caused the incurrence of response costs. The separate legal identities of Defendants should be disregarded in order to prevent fraud, illegality or injustice, and because according the entities separate legal status would defeat public policy and allow responsible parties to be shielded from liability.

49. Pursuant to Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), each of the Defendants is jointly and severally liable to the United States for all response costs incurred by EPA at the White Chemical Site and for interest on the amounts recoverable by the United States in this action.

Prayer for Relief

WHEREFORE, Plaintiff United States of America respectfully requests that this Court:

1. Enter judgment in favor of the United States against the Defendants, jointly and severally, for all costs incurred by the United States for response actions related to the White Chemical Site, totaling at least $15,800,000.00, plus interest;

2. Award the United States its costs and fees in this action; and

3. Grant such other and further relief as the Court deems appropriate.

Respectfully submitted,

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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW JERSEY

UNITED STATES OF AMERICA, Plaintiff, v. AZS CORPORATION TOYO SODA (AMERICA), INC. TOSOH CORPORATION TOSOH AMERICA INC. and TOSOH USA INC., Defendants.	Civil Action No.

CONSENT DECREE

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I. BACKGROUND

A. AZS Corporation ("AZS") owned the White Chemical Company Superfund Site in Newark, Essex County, New Jersey ("the Site") from August 28, 1975 through October 1, 1996. AZS leased the Site to the White Chemical Corporation from 1983 to 1990. During its tenancy, the White Chemical Corporation operated a manufacturing facility at the Site where it disposed of hazardous substances which were released into the environment.

B. In 1990, the U.S. Environmental Protection Agency ("EPA") found over 10,000 drums of hazardous substances at the Site, many of which were leaking or fuming. EPA also found over 12,000 laboratory-sized containers stored haphazardly in an on-Site laboratory. In response to the release or threatened release of hazardous substances at or from the Site, EPA undertook response actions at the Site pursuant to Section 104 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. § 9604. Additional response actions may be undertaken in the future. In performing response actions at the Site, the United States of America ("United States") has incurred response costs and will incur additional response costs in the future.

C. The United States alleges that AZS and its corporate affiliates: Toyo Soda (America), Inc., TOSOH Corporation, Tosoh America Inc., and Tosoh USA Inc. (collectively, "the Settling Defendants") are responsible parties pursuant to Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), and are jointly and severally liable for response costs incurred and to be incurred at or in connection with the Site.

D. The United States, on behalf of the Administrator of EPA, will lodge this Consent Decree with this Court and contemporaneously file a complaint in this matter pursuant to Section 107 of CERCLA, 42 U.S.C. § 9607, against the Settling Defendants seeking reimbursement of response costs incurred and to be incurred for response actions taken at or in connection with the release or threatened release of hazardous substances at the Site.

E. The Settling Defendants do not admit any liability or facts to Plaintiff arising out of the transactions or occurrences alleged in the complaint related directly or indirectly to the Site.

F. The United States has determined that settlement of this matter in consideration of payment of response costs by the Settling Defendants, as provided by this Consent Decree, is fair,

reasonable, and appropriate.

G. The United States and Settling Defendants agree, and this Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith, that settlement of this matter will avoid prolonged and complicated litigation between the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

THEREFORE, with the consent of the Parties to this Consent Decree, it is ORDERED, ADJUDGED, AND DECREED:

II. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1345 and 42 U.S.C. §§ 9607 and 9613(b) and also has personal jurisdiction over Settling Defendants for the purposes of this action. Solely for the purposes of this Consent Decree and the underlying complaint, Settling Defendants waive all objections and defenses that they may have to jurisdiction of the Court or to venue in this District. The Settling Defendants consent to and shall not challenge entry of this Consent Decree or this Court's jurisdiction to enter and enforce this Consent Decree. Settling Defendant TOSOH Corporation reserves the right to object to jurisdiction in any action not related to this Consent Decree and the underlying complaint.

III. PARTIES BOUND

2. This Consent Decree is binding upon the United States and upon Settling Defendants and their successors and assigns. Any change in ownership or corporate or other legal status of a Settling Defendant, including but not limited to, any transfer of assets or real or personal property, shall in no way alter such Settling Defendant's responsibilities under this Consent Decree. Each signatory to this Consent Decree certifies that he or she is authorized to enter into the terms and conditions of this Consent Decree and to bind legally the party represented by him or her.

IV. DEFINITIONS

3. Unless otherwise expressly provided herein, terms used in this Consent Decree which are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Consent Decree or in any appendix attached hereto, the following definitions shall apply:

a. "CERCLA" shall mean the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42

U.S.C. § 9601, et seq.

b. "Closeout Report" shall mean EPA's final Site Closeout Report which will be written after the completion of the response activities.

c. "Consent Decree" shall mean this Consent Decree and any attached appendices. In the event of conflict between this Consent Decree and any appendix, the Consent Decree shall control.

d. "Day" shall mean calender day. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business of the next working day.

e. "DOJ" shall mean the United States Department of Justice and any successor departments, agencies or instrumentalities of the United States.

f. "EPA" shall mean the United States Environmental Protection Agency and any successor departments, agencies or instrumentalities of the United States.

g. "EPA Hazardous Substance Superfund" shall mean the Hazardous Substance Superfund established by the Internal Revenue Code, 26 U.S.C. § 9507.

h. "Interest" shall mean interest at the current rate specified for interest on investments of the Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a).

i. "Paragraph" shall mean a portion of this Consent Decree identified by an arabic numeral or by an upper or lower case letter.

j. "Parties" shall mean the United States and the Settling Defendants.

k. "Plaintiff" shall mean the United States of America.

l. "Remedial Action" shall mean the interim remedy which was selected for the Site through the September 26, 1991 Record of Decision and any additional remedial action which may be selected in any future Record of Decision.

m. "Response Costs" shall mean all costs recoverable in an action under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), including but not limited to any direct and indirect costs, oversight costs, removal and/or remedial costs, together with accrued interest, that the United States or any other person has

incurred, is incurring and/or will incur in response to the release or threatened release of hazardous substances at or connected with the Site.

n. "Section" shall mean a portion of this Consent Decree identified by a roman numeral.

o. "Settling Defendants" shall mean AZS Corporation, Toyo Soda (America), Inc., TOSOH Corporation, Tosoh America Inc., and Tosoh USA Inc.

p. "Site" shall mean the White Chemical Corporation Superfund Site, encompassing approximately 4.4 acres, identified as Block 3782, Lot 107, on the tax map of Essex County, New Jersey and located at 660 Frelinghuysen Avenue, Newark, Essex County, New Jersey.

q. "United States" shall mean the United States of America, including its departments, agencies and instrumentalities.

V. REIMBURSEMENT OF RESPONSE COSTS

4. Payment of Response Costs to the EPA Hazardous Substance Superfund. Within thirty (30) days of entry of this Consent Decree, Settling Defendants shall pay $2.95 Million to the EPA Hazardous Substance Superfund. Six months after making this initial payment of $2.95 Million, Settling Defendants shall make a second payment of $2.95 Million, plus an additional sum for Interest on that amount calculated from the effective date of this Consent Decree through the date of the second payment, to the EPA Hazardous Substance Superfund. The total amount of $5.9 Million (plus applicable Interest) to be paid by Settling Defendants shall be for the settlement of Response Costs as defined herein. Each payment of $2.95 Million (plus applicable Interest) shall be made by FedWire Electronic Funds Transfer ("EFT") to the U.S. Department of Justice ("DOJ") account in accordance with current EFT procedures, referencing the United States Attorney's Office ("USAO") File Number _____, the EPA Region and Site Spill ID Number 02-6J, and DOJ Case Number 90-11-2-642B. Payments shall be made in accordance with instructions provided to Settling Defendants by the Financial Litigation Unit of the USAO in the District of New Jersey following lodging of the Consent Decree. Any payment received by DOJ after 4:00 PM Eastern Time shall be credited on the next business day. Settling Defendants shall send notice to EPA and DOJ that payments have been made in accordance with Section XIII (Notices and Submissions) and to:

Ron Gheradi, Chief
Financial Management Branch
U.S. Environmental Protection Agency, Region II
290 Broadway
New York, NY 10007-1866.

5. Of the total amount to be paid pursuant to Paragraph 4., $3 Million shall be deposited into the White Chemical Corporation Superfund Site Special Account within the EPA Hazardous Substance Superfund to be retained to conduct or finance future response actions at or in connection with the Site. Any balance remaining in the White Chemical Corporation Superfund Site Special Account shall be transferred by EPA to the EPA Hazardous Substance Superfund. The remaining $2.9 Million (and any applicable interest) shall be deposited into the EPA Hazardous Substance Superfund to be applied toward the reimbursement for response costs incurred and paid at or in connection with the Site by the EPA Hazardous Substance Superfund prior to date of entry of this Consent Decree.

VI. FAILURE TO COMPLY WITH REQUIREMENTS OF CONSENT DECREE

6. Interest on Late Payments. In the event that any payment required by Section V (Reimbursement of Response Costs) is not received when due, Interest shall continue to accrue on the unpaid balance through the date of payment.

7. Stipulated Penalty.

a. If any amounts due to EPA under this Consent Decree are not paid by the required date, Settling Defendants shall pay to EPA, as a stipulated penalty, in addition to the Interest required by Paragraph 6., $1,500 per day that such payment is late.

b. Stipulated penalties are due and payable within thirty (30) days of the date of demand for payment of the penalties by EPA. All payments to EPA under this Paragraph shall be made in accordance with the instructions in Paragraph 4. All payments shall indicate that the payment is for stipulated penalties and shall reference the name and address of the party making payment, the EPA Region and Site Spill ID Number 02-6J, USAO File Number _____, and DOJ Case Number 90-11-2-642B.

c. Penalties shall accrue as provided above regardless of whether EPA has notified Settling Defendants of the violation or made a demand for payment, but need only be paid upon demand. All penalties shall begin to accrue on the day after performance is due, or the day a violation occurs, and shall continue to accrue through the final day of correction of the noncompliance or completion of the activity. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate

violations of this Consent Decree.

8. If the United States brings an action to enforce this Consent Decree, Settling Defendants shall reimburse the United States for all costs of such action, including but not limited to costs of attorney time.

9. Payments made under Section VI (Failure to Comply with Requirements of Consent Decree) shall be in addition to any other remedies or sanctions available to Plaintiff by virtue of Settling Defendants' failure to comply with the requirements of this Consent Decree.

10. The obligations of Settling Defendants to pay amounts owed to the United States under this Consent Decree are joint and several. In the event of the failure of any one or more Settling Defendants to make the payments required under this Consent Decree, the remaining Settling Defendants shall be responsible for such payments.

11. Notwithstanding any other provision of this Section, the United States may, in its unreviewable discretion, waive payment of any portion of the stipulated penalties that have accrued pursuant to this Consent Decree.

VII. COVENANT NOT TO SUE BY PLAINTIFF

12. Except as specifically provided in Section VIII (Reservation of Rights by United States), the United States covenants not to sue Settling Defendants pursuant to Section 107(a) of CERCLA, 42 U.S.C. § 9607(a) to recover Response Costs. This covenant not to sue shall take effect upon receipt by EPA of all payments required by Section V (Reimbursement of Response Costs) and, if applicable, any amount due under Section VI (Failure to Comply with Consent Decree). This covenant not to sue is conditioned upon the satisfactory performance by Settling Defendants of their obligations under this Consent Decree. This covenant not to sue extends only to Settling Defendants and does not extend to any other person.

VIII. RESERVATION OF RIGHTS BY UNITED STATES

13. General Reservation of Rights by United States. The covenant not to sue set forth in Section VII (Covenant not to sue by Plaintiff) does not pertain to any matters other than those expressly specified therein. The United States reserves, and this Consent Decree is without prejudice to, all rights against Settling Defendants with respect to all other matters including:

a. liability for failure of Settling Defendants to meet a requirement of this Consent Decree;

b. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;

c. criminal liability; and

d. liability for costs incurred or to be incurred by the United States that are not "Response Costs" as defined herein.

14. Specific Reservation of Rights by United States. If any Settling Defendant has made material misstatements or material omissions in disclosing information to EPA in response to requests for information pursuant to Section 104(e) of CERCLA, 42 U.S.C. § 9604(e), with respect to the ownership, operation or control of the Site, or as to the corporate relationships between and among the Settling Defendants, then notwithstanding any other provisions of this Consent Decree, the United States reserves, pursuant to its authorities under Section 106 and 107 of CERCLA, 42 U.S.C. §§ 9606 and 9607, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel the Settling Defendants (1) to perform response actions relating to the Site, or (2) to reimburse the United States for additional costs of response actions.

15. Nothing in this Consent Decree is intended to be nor shall it be construed as a release, covenant not to sue, or compromise of any claim or cause of action, administrative or judicial, civil or criminal, past or future, in law or in equity, which the United States may have against any person, firm, corporation or other entity not a signatory to this Consent Decree.

IX. COVENANT NOT TO SUE BY SETTLING DEFENDANTS

16. Settling Defendants agree not to assert any claims or causes of action against the United States, or its contractors or employees, with respect to the Site or this Consent Decree, including but not limited to:

a. any direct or indirect claim for reimbursement from the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, based on Sections 106(b)(2), 107, 111, 112, or 113 of CERCLA, 42 U.S.C. §§ 9606(b)(2), 9607, 9611, 9612, or 9613, or any other provision of law;

b. any claims arising out of response activities at the Site;

c. any claim against the United States pursuant to Sections 107 and 113 of CERCLA, 42 U.S.C. §§ 9607 and 9613, relating to the Site; and

d. any claim against the United States pursuant to the U.S. Constitution, the Tucker Act, 28 U.S.C. § 1491, or at common law, arising out of or relating to access to, institutional controls on or other restrictions on the use or enjoyment of, or response activities undertaken at the Site.

17. Nothing in this Consent Decree shall be deemed to constitute approval or preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. 300.700(d).

X. EFFECT OF SETTLEMENT/CONTRIBUTION PROTECTION

18. Nothing in this Consent Decree shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Consent Decree. The United States and Settling Defendants each reserve any and all rights (including, but not limited to, any right to contribution), defenses, claims, demands, and causes of action which each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto.

19. The Parties agree that Settling Defendants are entitled, as of the effective date of this Consent Decree, to protection from contribution actions or claims as provided by Sections 113(f)(2) and 122(h)(4) of CERCLA, 42 U.S.C. §§ 9613(f)(2) and 9622(h)(4), for "matters addressed" in this Consent Decree. The "matters addressed" are Response Costs as defined herein. The "matters addressed" in this Consent Decree do not include those response actions or those response costs as to which the United States has reserved its rights under Section VIII (Reservation of Rights by United States) of this Consent Decree (except for claims for failure to comply with this Consent Decree), in the event that the United States asserts rights against Settling Defendants coming within the scope of any such reservation.

20. Each Settling Defendant agrees that with respect to any suit or claim for contribution brought by it for matters related to this Consent Decree, it will notify EPA and DOJ in writing no later than sixty (60) days prior to the initiation of such suit or claim. Each Settling Defendant also agrees that, with respect to any suit or claim for contribution brought against it for matters related to this Consent Decree, it will notify EPA and DOJ in writing within ten (10) days of service of the complaint or claim upon it. In addition, each Settling Defendant shall notify EPA and DOJ within ten (10) days of service or receipt of any Motion for Summary Judgment, and within ten (10) days of receipt of any order from a court setting a case for trial, for matters related to this Consent Decree.

21. In any subsequent administrative or judicial proceeding

initiated by the United States for injunctive relief, recovery of response costs, or other appropriate relief relating to the Site, Settling Defendants shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised in the subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the covenant not to sue set forth in Section VII (Covenant not to sue by Plaintiff).

XI. RETENTION OF RECORDS

22. Until five (5) years after the effective date of this Consent Decree, each Settling Defendant shall preserve and retain all records and documents now in its possession or control, or which come into its possession or control, that relate in any manner to response actions taken at the Site or to the liability of any person for response actions conducted and to be conducted at the Site, regardless of any corporate retention policy to the contrary.

23. After the conclusion of the document retention period in the preceding Paragraph, Settling Defendants shall notify EPA and DOJ at least ninety (90) days prior to the destruction of any such records or documents, and, upon request by EPA or DOJ, Settling Defendants shall deliver any such records or documents to EPA. Settling Defendants may assert that certain documents, records, or other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Settling Defendants assert such a privilege, they shall provide the United States with the following: 1) the title of the document, record, or information; 2) the date of the document, record, or information; 3) the name and title of the author of the document, record, or information; 4) the name and title of each addressee and recipient; 5) a description of the subject of the document, record, or information; and 6) the privilege asserted. However, no documents, reports, or other information created or generated pursuant to the requirements of this or any other judicial or administrative settlement with the United States shall be withheld on the grounds that they are privileged. If a claim of privilege applies only to a portion of a document, the document shall be provided to the United States in redacted form to mask the privileged information only. Settling Defendants shall retain all records and documents that they claim to be privileged until the United States has had a reasonable opportunity to dispute the privilege claim and any such dispute has been resolved in the Settling Defendants' favor.

XII. CERTIFICATION

24. By signing this Consent Decree, each Settling Defendant certifies individually, that, to the best of its knowledge and belief, it has:

a. conducted a thorough, comprehensive, good faith search for documents, and has fully and accurately disclosed to EPA, all information currently in its possession, or in the possession of its officers, directors, employees, contractors or agents, which relates in any way to (i) the ownership, operation or control of the Site; (ii) the ownership, possession, generation, treatment, transportation, storage or disposal of a hazardous substance pollutant or contaminant at or in connection with the Site; or (iii) the corporate relationships between and among the Settling Defendants;

b. not altered, mutilated, discarded, destroyed or otherwise disposed of any records, documents or other information relating to its potential liability regarding the Site, after notification of potential liability or the filing of a suit against the Settling Defendant regarding the Site; and

c. fully complied with any and all EPA requests for information regarding the Site pursuant to Sections 104(e) and 122(e) of CERCLA, 42 U.S.C. §§ 9604(e) and 9622(e).

XIII. NOTICES AND SUBMISSIONS

25. Whenever, under the terms of this Consent Decree, notice is required to be given or a document is required to be sent by one Party to another, it shall be directed to the individuals at the addresses specified below, unless those individuals or their successors give notice of a change to the other Parties in writing. Written notice as specified herein shall constitute complete satisfaction of any written notice requirement of this Consent Decree with respect to the United States, EPA, DOJ, and Settling Defendants, respectively.

As to the United States:

Chief, Environmental Enforcement Section
United States Department of Justice
P.O. Box 7611
Benjamin Franklin Station
Washington, DC 20044

Chief, New Jersey Superfund Branch
Office of Regional Counsel
U.S. Environmental Protection Agency
290 Broadway, 17th Floor
New York, NY 10007-1866
Attention: White Chemical Site Attorney

Chief, Special Projects Branch
Emergency and Remedial Response Division
290 Broadway, 18th Floor
New York, NY 10007-1866
Attention: White Chemical Site Project Manager

As to Settling Defendants:

Richard G. Leland, Esquire
Rosenman & Colin, LLP
575 Madison Avenue
New York, NY 10022

XIV. RETENTION OF JURISDICTION

26. This Court shall retain jurisdiction over this matter for the purpose of interpreting and enforcing the terms of this Consent Decree.

XV. INTEGRATION

27. This Consent Decree constitutes the final, complete and exclusive agreement and understanding among the Parties with respect to the settlement embodied in this Consent Decree. The Parties acknowledge that there are no representations, agreements or understandings relating to the settlement other than those expressly contained in this Consent Decree.

XVI. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

28. This Consent Decree shall be lodged with the Court for a period of not less than thirty (30) days for public notice and comment. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations which indicate that this Consent Decree is inappropriate, improper, or inadequate. Settling Defendants consent to entry of this Consent Decree without further notice.

29. If for any reason this Court should decline to approve this Consent Decree in the form presented, this agreement is voidable at the sole discretion of any party and the terms of the agreement may not be used as evidence in any subsequent litigation, action or administrative proceeding between the

Parties.

XVII. EFFECTIVE DATE

30. The effective date of this Consent Decree shall be the date upon which it is entered by the Court.

XVIII. SIGNATORIES/SERVICE

31. Each undersigned representative of a Settling Defendant to this Consent Decree and the Assistant Attorney General for the Environment and Natural Resources Division of the United States Department of Justice certifies that he or she is authorized to enter into the terms and conditions of this Consent Decree and to execute and bind legally such Party to this document.

32. Each Settling Defendant hereby agrees not to oppose entry of this Consent Decree by this Court or to challenge any provision of this Consent Decree, unless the United States has notified Settling Defendants in writing that it no longer supports entry of the Consent Decree.

33. Each Settling Defendant shall identify, on the attached signature page, the name and address of an agent who is authorized to accept service of process by mail on behalf of that Party with respect to all matters arising under or relating to this Consent Decree. Settling Defendants hereby agree to accept service in that manner and to waive the formal service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any applicable local rules of this Court, including but not limited to, service of a summons.

SO ORDERED THIS _____ DAY OF _____, 19____.

_____
United States District Judge

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of United States v. AZS Corporation, et al. relating to the White Chemical Corporation Superfund Site.

FOR THE UNITED STATES OF AMERICA

Date: _____

Lois J. Schiffer
Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice
Washington, D.C. 20530

Date: 1/29/99

Henry S. Friedman
Richard C. Visek
Attorneys
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, DC 20044-7611

Faith S. Hochberg
United States Attorney
for the District of New Jersey

Date: 2/1/99

By: _____

Susan Cassell
Assistant United States Attorney
District of New Jersey
970 Broad Street, Suite 700
Newark, New Jersey 07102
Tracking # SC-8081

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of United States v. AZS Corporation, et al. relating to the White Chemical Corporation Superfund Site.

Date: 12/28/98

Jeanne M. Fox

Jeanne M. Fox
Regional Administrator, Region II
U.S. Environmental Protection Agency
290 Broadway
New York, NY 10007-1866

Date: 12/22/98

Alexandra Varlay

Alexandra Varlay
Assistant Regional Counsel
U.S. Environmental Protection Agency
290 Broadway, 17th Floor
New York, NY 10007-1866

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of United States v. AZS Corporation, et al. relating to the White Chemical Corporation Superfund Site.

For: AZS Corporation
Settling Defendant

Date: 12/15/98

Signature

Y. HORIKO
Name - Please Type

PRESIDENT
Title

1100 CIRCLE 75 PARKWAY, SUITE 500
Address

ATLANTA, GA 30339

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Richard G. Leland
Joel W. Sternman

Title: Partner(s)

Address: Rosenman & Colin LLP

575 Madison Avenue

New York, New York 10022

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of United States v. AZS Corporation, et al. relating to the White Chemical Corporation Superfund Site.

For: Toyo Soda (America), Inc.
Settling Defendant

Date: 12/15/98

Signature

Y HORIKO
Name - Please Type

PRESIDENT
Title

1100 CIRCLE 75 PARKWAY, SUITE 600
Address

ATLANTA, GA 30339

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Richard G. Leland
Joel W. Sternman

Title: Partner(s)

Address: Rosenman & Colin LLP

575 Madison Avenue

New York, New York 10022

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of United States v. AZS Corporation, et al. relating to the White Chemical Corporation Superfund Site.

For: TOSOH Corporation
Settling Defendant

Date: _____

_____
Signature

Mr. Takashi Maruyama
Name - Please Type

Managing Director
Title

1-7-7, Akasaka, Minato-Ku, Tokyo 107-0052, JAPAN
Address

_____

_____

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Richard G. Leland
Joel W. Sternman

Title: Partner(s)

Address: Rosenman & Colin LLP

575 Madison Avenue

New York, New York 10022

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of United States v. AZS Corporation, et al. relating to the White Chemical Corporation Superfund Site.

For: Tosoh USA Inc.
Settling Defendant

Date: 12/15/98

Y. Horiko
Signature

Y. HORIKO
Name - Please Type

PRESIDENT
Title

1100 CIRCLE 75 PARKWAY SUITE 600
Address

ATLANTA, GA 30339

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Richard G. Leland
Joel W. Sternman

Title: Partner(s)

Address: Rosenman & Colin LLP

575 Madison Avenue

New York, New York 10022

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of United States v. AZS Corporation, et al. relating to the White Chemical Corporation Superfund Site.

For: Tosoh America Inc.
Settling Defendant

Date: 12/15/98

Signature

Y. HORIKO
Name - Please Type

PRESIDENT
Title

3600 GANTZ RD
Address

GROVE CITY, OH 43123

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name: Richard G. Leland
Joel W. Sternman

Title: Partner(s)

Address: Rosenman & Colin LLP

575 Madison Avenue

New York, New York 10022

Roy F. Weston, Inc.
GSA Raritan Depot
Bldg. 209 Annex (Bay F)
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679
732-321-4200 • Fax 732-494-4021

DATE: 30 April 1998

TO: Andre Zownir, U.S. EPA/ERTC Work Assignment Manager

THROUGH: Edward F. Gilardi, REAC Program Manager

FROM: James L. Brown, REAC Task Leader

SUBJECT: SITE ASSESSMENT, WHITE CHEMICAL FACILITY, NEWARK, N.J.
WORK ASSIGNMENT 2-331 - SUMMARY LETTER REPORT

BACKGROUND AND OBJECTIVES

The U. S. Environmental Protection Agency (U.S. EPA) Environmental Response Team Center (ERTC) was activated by the Region II Remedial Project Manager (RPM) to conduct a surface and subsurface environmental investigation and to estimate the cost of building demolition and debris disposal at the White Chemical Company (WCC) Site. The WCC Site is located on 4.4 acres at 660 Frelinghuysen Avenue, Newark, Essex County, New Jersey. Freylinghuysen Avenue is a major thoroughfare with large residential and commercial populations, as well as major industry, within 0.5 miles of the site. Major transportation facilities in the immediate vicinity include Newark International Airport, Conrail and Amtrak lines, and U. S. Highway Routes 1 and 9. A site location map is presented in Figure 1.

The WCC Site is currently inactive, but was formerly used for the manufacture of acid chlorides, brominated organic compounds, mineral acids and fire retardant compounds. Three major buildings (Building Numbers 33, 34 and 35) and three smaller, facility support buildings (Boiler Room, Pump House and Maintenance Shop) are located on the site (Figure 2). Beginning in May 1990 and continuing until March 1993 a series of removal actions were conducted at the WCC Site by the New Jersey Department of Environmental Protection (NJDEP), the U.S. EPA, and a Potentially Responsible Party (PRP) group. The information cited above was received from the WCC Draft Focused Feasibility Study (FFS) Report (EPA 1991) and the WCC Draft Remedial Investigation (RI)/Feasibility Study (FS) Work Plan (Malcolm Pirnie/CH2M Hill 1996).

The U.S. EPA's RPM has tasked the U. S. EPA's ERTC Work Assignment Manager (WAM) to provide technical support to assist in determining the extent of contamination at the WCC Site. The WCC Site has been proposed for development under the New Jersey Brownfields Program. Response Engineering and Analytical Contract (REAC) personnel were tasked to monitor contaminants in surface soil and sediment, subsurface soils, and building interiors. Contaminants monitored in soil include total dioxins, polybrominated biphenyls (PBBs), BNAs, TAL inorganics and VOCs. Suspect asbestos containing material (ACM) was collected from building interiors. Wipe samples were analyzed for total phenols, cyanide, PBBs and TAL inorganics. Paint chip samples were analyzed for lead. REAC was also requested to estimate the

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volume of debris contained at the WCC Site, and the estimated cost for debris disposal. Similarly, the cost of building demolition and debris disposal was also requested. The investigations were conducted by REAC in two phases, as described below. All work was conducted in accordance with approved QA Work Plans for the WCC Site.

On 26 through 29 January 1998, a Phase I site investigation was conducted at the WCC Site. During this investigation, surface and subsurface soil samples were collected, and suspect ACM, paint chip, and wipe samples were taken from building interiors. Surface soil samples were collected at 13 locations. Subsurface soil samples were collected by hand augering at four locations. Wipe samples were analyzed for PBBs, total phenols, cyanide and TAL inorganics. Paint chip samples were analyzed for lead. Soil and sump sediment samples were analyzed for total dioxins, PBBs, TAL inorganics and BNAs. In addition to these parameters, subsurface soil samples were analyzed for VOCs. Suspect ACM insulating material was also sampled. Soil sample locations were selected partially on a judgmental basis and partially on the basis of proposed locations presented in the WCC Draft Remedial Investigation (RI)/Feasibility Study (FS) Work Plan (Malcolm Pirnie/CH2M Hill 1996). Two sediment samples were collected from sumps located from the west ends of Buildings 33 and 34. All exterior sampling locations are shown in Figure 2. Wipe samples from interior walls at 15 locations within Buildings 33, 34 and 35, and the boiler room and maintenance shop. Wipe sample locations in these buildings were selected either where there was evidence of staining or in proximity to exhaust fans. Paint chip samples were taken at five locations in Buildings 33, 34 (west end) and 35. Suspect ACM insulating material was sampled at 16 interior locations based on visual identification of representative material.

On 16 and 17 March 1998, a Phase II site investigation was conducted at the WCC Site. During this investigation, subsurface samples were collected at 2-foot intervals to a depth of 10 feet below ground surface (bgs) at 15 locations using a Geoprobe® drill rig. Soil samples were analyzed for total dioxins, PBBs, PCBs, TAL inorganics, BNAs and VOCs. For non-volatile analytes, all surface (0-2 foot) soil samples were extracted and analyzed. Remaining deeper samples were extracted and held for possible future analysis. Most soil samples collected for VOCs analysis were from depths of 0-2 feet and 8-10 feet bgs. All soil cores were screened using an organic vapor analyzer (OVA). At some locations, when organic vapors were detected at elevated levels, additional samples were analyzed for VOCs. During the Phase I investigation, soil samples taken from locations WC-1 through WC-13 were inadvertantly not analyzed for BNAs. These locations were resampled during the Phase II investigation, and samples were analyzed for BNAs. Sampling methods and sample documentation, packaging and shipment were all conducted in accordance with ERTC/REAC standard operating procedures (SOPs).

On 23 April 1998, a site visit was conducted at the WCC site to estimate the volume of and cost of debris disposal, including demolition and disposal of building debris, and the cost of removal, remediation, and disposal of contaminated soil and sediment.

FIELD OBSERVATIONS AND PRESENTATION OF ANALYTICAL RESULTS

Most of the WCC Site is paved with either asphalt or concrete. The surface soil samples taken during the Phase I investigation were collected from the few remaining unpaved areas at the site. This is also true for Phase I subsurface samples taken by hand augering. Generally, interior wall staining was minimal in the chemical process buildings. Samples for lead in paint were taken from locations representative of large painted surfaces. Phase II sampling locations required cutting through pavement to access underlying soil material. In general, most soil appeared to be of natural origin, and contained little or no heterogeneous fill material. Most of the southern portion of the WCC is covered with roofing debris and car parts.

Sample analytical data were compared to proposed NJDEP soil standards for industrial property, when these exist. Analytical data for PBBs are presented as the sum of all PBB homologues. There are currently no proposed NJDEP standards for PBBs in soil.

Dioxin data are evaluated using 2,3,7-8-tetrachlorodibenzodioxin (2,3,7-8-TCDD) equivalency factors in accordance with EPA guidance (EPA 1989). Dioxin action levels within New Jersey for industrial properties are specified on a case-by-case basis when dioxins normalized to 2,3,7-8-TCDD exceed 1 microgram/kilogram (μg/Kg). Provided 2,3,7-8-TCDD levels do not exceed 20 μg/Kg, the preferred remedial measure is containment beneath at least two feet of clean soil. This guidance is based on a May 1987 memo to the Agency for Toxic Substances and Disease Registry from the Federal Centers for Disease Control, U.S. Public Health Service, Department of Health and Human Services regarding cleanup of dioxin contaminated soil at sites in Missouri.

There is currently no NJDEP guidance for disposal of demolition and disposal debris. Contaminant limits for debris disposal are determined by the landfill facility receiving such debris. Building interiors may require cleaning prior to demolition and disposal. If buildings at the WCC are to be reused, the New Jersey Department of Health has authority to set building interior standards for contaminants. Wipe sample data can therefore be used for either debris disposal requirements or building occupany standards, depending on whether buildings at the WCC Site are reused or demolished. If buildings are to be demolished, all materials suspected of containing hazardous substances should be segregated to the extent practicable.

In the following discussion, data are presented sequentially for the Phase I and II investigations, respectively. For Phase I, soil data will be present first, followed by wipe, ACM, and paint chip results. Data from the Phase I investigation have been validated, while Phase II data have not. Phase II data are therefore considered preliminary. An addendum to this Summary Letter Report will be issued with attached final validated data from the Phase II investigation. If data are revised during the data validation process, those revisions will be noted.

PHASE I INVESTIGATION RESULTS

Table 1 presents a summary of soil samples collected during the Phase I investigation. Twenty two samples were collected at locations shown in Figure 2. The locations sampled were judgmentally selected based on their proximity to process buildings and tank storage areas, and expected contaminant migration routes. As stated above, the Phase I soil investigation was limited to areas sampleable with hand operated equipment. Dioxin levels in Phase I soil samples are presented in Table 5. The final analytical data for dioxin and PBBs in Phase I are attached in Appendix E. Most of the samples were taken at or near the surface; however, at four locations, samples were collected at depths up to 8.5 feet bgs. These deeper samples are designated as subsurface soil samples in Figure 2, as distinct from soil boring samples collected during Phase II. The dioxin data in Table 5 are normalized to 2,3,7-8-TCDD, and compared to the NJDEPs proposed action level of 1 μg/Kg in soil. Only one of the 22 samples contained normalized dioxin in excess of 1 μg/Kg. That sample, WC-4, contained 2.2059 μg/Kg. The sample was collected from 0 to 0.2 feet bgs approximately 30 feet east of the northeast corner of the maintenance shop, as shown in Figure 2. During the subsequent Phase II subsurface investigation, Soil Boring 5 (SB-5) was collected near this location to determine if dioxin was present at a greater soil depth. Results of the Phase II investigation will be presented later in this section. The remaining 21soil samples contained minimal dioxin, with a range between 0.0007 μg/Kg and 0.2867 μg/Kg.

PBBs in soil samples collected during Phase I are presented in Table 6. As cited above, the NJDEP has not proposed a soil cleanup standard for PBBs. Polychlorinated biphenyls were present in all surficial soil samples, and also the sump sediments contained in Buildings 33 and 34. However, PBBs were not detected in any subsurface soil samples. Levels of PBBs detected in the Building 33 and 34 sumps were 362 and 322 μg/Kg, respectively. In surficial soil samples, PBBs ranged widely from 0.7μg/Kg along the north fence line (WC-1) to 5,043 μg/Kg near the northeast corner of the maintenance shop (WC-4). It is noteworthy that WC-4 is the same location where total dioxin was found at an elevated level of 2.2059 μg/Kg.

Semivolatile organic compounds (BNAs) that exceed proposed NJDEP soil cleanup criteria for non-residential sites are presented in Table 7. The data are from one sample sample collected from the sump trough in Building 33. The three polycyclic aromatic hydrocarbons (PAHs) that exceed proposed criteria are suspected carcinogens. None of the 14 surficial samples taken at locations WC-1 through WC-14 contained any of the BNAs in excess of proposed NJDEP soil cleanup criteria for non-residential sites.

Target Analyte List (TAL) inorganics in soil and sediment collected during Phase I that exceed proposed NJDEP cleanup criteria for non-residential sites are presented in Table 8. A sump trough sediment sample from Building 33 and several surface soil samples exceeded, lead, thallium, antimony, copper and beryllium levels for proposed cleanup criteria. Only one contaminant, copper, was found at more than an order of magnitude higher than the proposed criterion. That sample, WC-4, also contained excessive lead and thallium levels. As cited above, the sample at WC-4 also contained dioxin above the NJDEP action level and the highest level of PBBs. At location WC-6, which is also near the northeast corner of the maintenance shop, levels of antimony, lead and thallium exceeded proposed NJDEP criteria. One subsurface sample collected in Phase I exceeded the NJDEP criterion for beryllium. This sample was taken outside the south entrance of Building 34.

Some VOCs were detected in subsurface soil during the Phase I investigation. However, none of these exceeded the proposed NJDEP cleanup criteria for non-residential soil. Final analytical data for VOCs, BNAs, cyanide, total phenols, TAL Inorganics and lead for soil, wipe and paint chip samples taken in the Phase I investigation are attached in Appendix F.

Table 2 presents a summary of wipe sample locations for the Phase I investigation. Wipe samples were collected at 15 locations from interior walls of Buildings 33, 34 and 35, plus the maintenance shop and boiler room. At stated earlier, there are no existing NJDEP criteria for evaluation of wipe sample data. Samples were analyzed for PBBs, total phenols, cyanide and TAL inorganics. Two wipe sample locations were selected for analysis of mercury instead of TAL inorganics. At each wipe location, one of four adjacent square sections was sampled for each group of analytes. Each square area was 10 in. x 10 in. Total phenols in wipe samples are presented in Table 10. Phenols were found in 8 of 14 samples at levels ranging from 0.0026 to 0.0042 μg/wipe. Cyanide was identified in 10 of 14 wipe samples at levels ranging from 0.26 to 7.6μg/wipe. The highest cyanide levels were found in samples taken in the center section of Building 34. Table 12 presents wipe sample results for mercury. One sample each was taken from the worst appearing stained areas within Buildings 33 and 34, where chemical processing occurred. A mercury level of 1.6 μg/wipe was found in Building 33, while 0.14 μg/wipe was found in Building 34. The remaining TAL inorganics were analyzed in 13 of 15 wipe samples. Results are presented in Table 13. A large number of inorganics were identified at what appear to be trace levels. The highest analytes concentration found was for zinc, at 82,100 μg/wipe in the maintenance shop. In Building 34, the predominant elements detected in five wipe samples were zinc (up to 5,000 μg/wipe), lead (up to 2,300 μg/wipe) and copper (up to 1,030 μg/wipe). Other elements detected at lower levels include antimony, chromium, titanium, vanadium, arsenic and

cadmium. The same relative levels of elements were present in two wipe samples from Building 35. In a single wipe sample from the boiler room, none of the analytes exceeded 1,000 μg/wipe. In Building 33, the levels of zinc, copper and lead were lower relative to other elements in five wipe samples. In these samples, only zinc exceeded 1,000 μg/wipe.

A summary of suspect ACM insulation sampled during the Phase I investigation is presented in Table 3. Supporting analaytical data are attached in Appendix G. Sixteen samples were taken from Buildings 33, 34 and 35 and the maintenance shop and boiler room. ACM was positively identified in 10 of the 16 samples. The length of ACM pipe insulation was estimated, as was the volume of ACM insulation surrounding a boiler room incinerator. Estimated costs of ACM disposal are included in Appendix J attached to this report.

Paint chip sample analysis for lead collected during the Phase I investigation are presented in Table 4. The lead concentrations in the five samples vary from 10.8 to 1,670 mg/Kg. According to the U.S. EPA (1993), lead levels in solid wastes such as woodwork, plaster, doors and similar building components are considered to be hazardous when the lead level in paint on these wastes exceeds 4 mg/square centimeter (cm^2). Based on this standard, none of the building materials from which paint samples were taken would be considered hazardous under Resource Conservation and Recovery Act (RCRA) regulations.

PHASE II INVESTIGATION RESULTS

In the Phase II investigation, 15 locations were selected for the subsurface soil investigation. Unless otherwise specified, all Phase II data are preliminary only, and have not been validated. Table 14 presents a summary of samples extracted and analyzed for dioxins, PBBs, BNAs and TAL inorganics. Only the 0-2 foot bgs samples were analyzed, and the remaining samples from 2-10 feet bgs were extracted and held for possible future analysis. These deeper sample extracts may be analyzed at the discretion of the U.S. EPA's WAM. Preliminary analytical data for dioxins and PBBs from the Phase II investigation are attached in Appendix H.

A summary of positive detections for dioxins in Phase II soil samples taken from 0-2 feet bgs is presented in Table 16. As with Phase I data, all dioxins have been normalized to 2,3,7-8-TCDD using a toxicity equivalent factor, and then compared to the proposed NJDEP action level of 1μg/Kg. Dioxin levels in Table 16 are very low, ranging from 0.0031 to 0.2259 1μg/Kg, with a mean value of 0.0555 1μg/Kg. The very low levels of dioxin present at 0-2 feet bgs would seem to preclude analysis of deeper soil samples. The soil description data in Appendix A incidate that relatively undisturbed, native soil materials underly the site, with minimal evidence of fill. There was no recognizable buried waste in any of the soil borings.

In the Phase II subsurface investigation, PBBs were not detected in any of the 0-2 foot bgs soil samples. These results are consistent with dioxin data from the subsurface. Apparently, PBBs are present only near the surface at the WCC Site. As stated above, the absence of PBBs at this depth interval would seem to precluded analysis of deeper soil samples.

Only a single PCB aroclor was detected in the 15 subsurface soil samples. Aroclor 1254 was found at 1.2 mg/Kg at SB-12. This level is less than the 2 mg/Kg level proposed for non-residential soils by the NJDEP. This result is also consistent with the absence of visual contamination in the subsurface at the WCC Site. A single surficial soil sample was also collected for analysis of PCBs, at location WC-11. At this location, adjacent to Building 33, a transformer was lying on the surface with a surrounding oily residue. Analysis of the surficial soil sample at this location, however, showed PCBs to be absent. The preliminary analytical data for PCBs and all remaining analytes for the Phase II investigation are attached in Appendix I.

A summary of positive BNA detections that exceed proposed NJDEP soil cleanup criteria for non-residential sites is presented in Table 17. Phthalates were found in several samples at relatively low levels; they probably represent laboratory contaminants. Three of the 15 soil boring samples contained detectable BNAs in addition to phthalates. Two of these samples, at locations SB-10 and SB-11, contained BNAs at levels in excess of proposed NJDEP cleanup criteria.

TAL inorganics in soil samples collected during the Phase II investigation that exceed proposed NJDEP soil cleanup criteria are presented in Table 18. At two locations, SB-9 and SB-15, both lead and zinc exceed proposed NJDEP cleanup criteria in soil taken from 0-2 feet bgs. Location SB-9 is in the southeast corner of Building 33, within the building. Location SB-15 is near the southwest corner of Building 33. Arsenic was also present in a large number of samples with a range from 1.3 to 15 mg/Kg. The proposed NJDEP soil arsenic cleanup standard for non-residential sites is 2 mg/Kg. However, the proposed standards recognize background levels for arsenic can be as high as 20 mg/Kg. Levels of arsenic at the WCC Site may represent background levels for this location.

Some VOCs were detected in subsurface soil during the Phase II investigation. However, none of these exceeded the proposed NJDEP cleanup criteria for non-residential soil.

ESTIMATION OF BUILDING DEMOLITION, DEBRIS AND SOIL DISPOSAL COSTS

Estimated costs for building demolition and debris disposal, and soil treatment and off-site disposal are attached in Appendix J. All assumptions used in cost estimation are listed in the appendix. Building demolition will be restricted to the surface. Foundations, slabs and pavement will remain. Only a small volume (2 cubic yards) of soil and sediment was selected for excavation and off-site treatment and disposal. The soil/sediment treatment technology train includes both incineration and stabilization/solidification of incinerator ash because the soil contains inorganic contaminants in addition to dioxins and PBBs. However, it is possible that soil/sediment could be accepted for disposal at a hazardous waste (RCRA Subtitle B) landfill. Excavation, treatment and disposal of subsurface soil is not included, because contamination identified during the Phase II investigation is minimal.

SUMMARY

The level and extent of both surface and subsurface contamination at the WCC Site is minimal. Only 1 of 22 soil samples taken in the Phase I surface investigation contained dioxin in excess of the NJDEP proposed action level of 1 μg/Kg, normalized to 2,3,7-8-TCDD. Although PBBs were ubiquitous in surface soil and sump sediment from within Buildings 33 and 34, they were absent in the subsurface. There are no proposed NJDEP soil cleanup criteria for PBBs. The highest dioxin and PBB levels were found in soil taken at the same location, WC-4, close to the northeast corner of the maintenance shop. A single sediment sample from the sump trough in Building 33 contained BNAs in excess of proposed NJDEP criteria. Inorganic contaminants in excess of proposed NJDEP criteria were found in the Building 33 sump trough and at locations WC-4 and WC-6 near the northeast corner of the maintenance shop. A single subsurface soil sample taken outside the south enterance of Building 34 during Phase I contained beryllium in excess of the proposed cleanup criterion.

Wipe samples were taken from interior walls within Buildings 33, 34, 35, the boiler room and maintanance shop. Wall staining was minimal. Phenols were found in 8 of 14 samples at levels ranging from 0.0026 to 0.0042 μg/wipe. Cyanide was identified in 10 of 14 wipe samples at levels ranging from 0.26 to 7.6μg/wipe. The highest cyanide levels were found in samples taken in the center section of Building 34. A mercury level of 1.6 μg/wipe was found in Building 33, while 0.14 μg/wipe was found in Building 34. A large number of TAL inorganics were identified at what appear to be trace levels. There are currently no standards for wipe samples. However, it is always adviseable to segregate stained from unstained building debris during demolition in the event stained debris is not acceptable for disposal as construction. During the Phase I investigation, ACM was found inside all buildings, but only in small quantities. Paint chip sample analysis for lead during the Phase I investigation were found to be nonhazardous under RCRA.

In the Phase II subsurface soil investigation, the 0-2 foot bgs samples were analyzed, while the remaining deeper samples were extracted and held. Examination of soil cores collected during the Phase II investigation did not provide any visual evidence of subsurface soil contamination. Having considered the above information, a decision was made by the U.S. EPA's WAM not to analyze extracts from deeper soil samples taken during the subsurface investigation. Dioxin in all subsurface samples was well below the 1 μg/Kg action level at all locations, and PBBs were undetected. Polybrominated biphenyls are present only near the surface at the WCC Site. Only a single PCB aroclor was detected, but at a level less than the 2 mg/Kg level proposed for non-residential soils by the NJDEP. Two subsurface samples, at locations SB-10 and SB-11, contained BNAs at levels in excess of proposed NJDEP cleanup criteria. At two locations, SB-9 and SB-15, both lead and zinc exceeded proposed cleanup criteria. Arsenic was present in a large number of samples from 1.3 to 15 mg/Kg. These arsenic levels may represent background levels for this location.

The estimated cost for building demolition, debris disposal and contaminated soil treatment and disposal is $825,000.

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TABLE I
Summary of Soil Samples Collected During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Depth (ft)	Analysis
WC-1	2331-035	1/27/98; 3/17/98	N. fence line	0-0.3	Dioxin, PBB, TAL metals, BNA
WC-2	2331-036	1/27/98; 3/17/98	Near NE corner of site	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-3	2331-037	1/27/98; 3/17/98	Between Bldgs. 34 & 34A	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-4	2331-038	1/27/98; 3/17/98	Near NE corner of Maint. Shop	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-5	2331-039	1/27/98; 3/17/98	E of Maint. Shop in Open Storage Area	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-6	2331-040	1/27/98; 3/17/98	NE corner of Maint. Shop	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-7	2331-041	1/27/98; 3/17/98	Tank Storage Area	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-8	2331-042	1/27/98; 3/17/98	Tank Storage Area	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-9	2331-043	1/27/98; 3/17/98	Tank Storage Area	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-10	2331-044	1/27/98; 3/17/98	Between Boiler Room & Bldg. 33	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-11	2331-045	1/27/98; 3/17/98	S of Bldg. 33	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-12	2331-046	1/27/98; 3/17/98	Tank area S of Bldg. 35	0-0.2	Dioxin, PBB, TAL metals, BNA
WC-13	2331-047	1/27/98; 3/17/98	S end of tank area S of Bldg. 35	0-0.2	Dioxin, PBB, TAL metals, BNA

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TABLE 1 (Cont'd)
Summary of Soil Samples Collected During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Depth (ft)	Analysis
WC-14	2331-048	1/27/98; 3/17/98	E. fence line	0-0.2	Dioxin, PBB, TAL Metals, BNA
Bldg. 33 Sump	2331-058	1/28/98	Bldg. 33 sump trough; composite	0-0.3	Dioxin, PBB, TAL Metals, BNA
Bldg. 34 Sump	2331-059	1/28/98	Bldg. 34 sump	0-0.5	Dioxin, PBB, TAL Metals, BNA
WC-15D	2331-060	1/28/98	Near NE corner of Bldg. 35	1-2	Dioxin, PBB, TAL Metals, BNA, VOCs
Bldg. 34D-1	2331-061	1/28/98	Outside S entrance of Bldg. 34	0.7-1.3	Dioxin, PBB, TAL Metals, BNA, VOC
Bldg. 34D-2	2331-062	1/28/98	Outside S entrance of Bldg. 34	6-7	Dioxin, PBB, TAL Metals, BNA, VOC
WC-16D	2331-063	1/28/98	SE corner of Maint. Shop	4-5	Dioxin, PBB, TAL Metals, BNA, VOC
WC-3D1	2331-064	1/28/98	Between Bldg. 34 & Bldg. 34A	0.6-1.5	Dioxin, PBB, TAL Metals, BNA, VOC
WC-3D2	2331-065	1/28/98	Between Bldg. 34 & Bldg. 34A	7.5-8.5	Dioxin, PBB, TAL Metals, BNA, VOC

TABLE 2
Summary of Wipe Samples Collected During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Analysis
Bldg. 34-A	2331-004	1/26/98	6 ft S of NW corner; 3 ft height	PBB, Phenol, Cyanide, TAL Metals
Bldg. 34-B	2331-006	1/26/98	24 ft N of SW corner on W wall; 3 ft height	PBB, Phenol, Cyanide, TAL Metals
Bldg. 34-C	2331-008	1/26/98	E wall Bldg. 34A; 18 ft from SE corner	PBB, Phenol, Cyanide, TAL Metals
Bldg. 34-D	2331-010	1/26/98	W end of bldg.; 23 ft N of S side; 4.5 ft height	PBB, Phenol, Cyanide, TAL Metals
Bldg. 34-E	2331-012	1/26/98	W end of bldg.; 10 ft from SW corner; 4 ft height	PBB, Phenol, Cyanide, TAL Metals
Maint.-A	2331-023	1/26/98	Center of W wall; below exhaust fan; 5 ft height	PBB, Phenol, Cyanide, TAL Metals
Boiler Room-A	2331-021	1/26/98	Boiler Room; 2 ft from SE corner; 3.5 ft height	PBB, Phenol, Cyanide, TAL Metals
Bldg. 33-A	2331-001	1/26/98	Behind Tank 59; 32 ft W of E wall; 4 ft height	PBB, Phenol, Cyanide, TAL Metals
Bldg. 33-B	2331-003	1/26/98	2nd floor; 62 ft W of E wall; 20 ft height	PBB, Phenol, Cyanide, TAL Metals

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TABLE 2 (Cont'd)
Summary of Wipe Samples Collected During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Analysis
Bldg. 35-A	2331-014	1/26/98	2nd floor; S wall, 2 ft from SE corner; 1.5 ft height	PBB, Phenol, Cyanide, TAL Metals
Bldg. 35-B	2331-016	1/26/98	1st floor; 3rd section from E, N wall, 10 ft W of E wall; 2 ft height	PBB, Phenol, Cyanide, TAL Metals
Bldg. 33-C	2331-027	1/27/98	N side of bldg.; S wall, in room identified by OHM Corp. as containing haz. materials; 2 ft height	PBB, Phenol, Cyanide, TAL Metals
Bldg. 33-D	2331-031	1/27/98	N side of bldg.; 2nd floor lab; taken under hood	PBB, Phenol, Cyanide, TAL Metals
Bldg. 33-E	2331-029	1/27/98	N side of bldg. on E end; 2nd floor lab; taken on wall adjacent to hood; 4 ft height	PBB, Phenol, Cyanide, TAL Metals
Bldg. 33-F	2331-030	1/27/98	1st floor office; N side of bldg; 3 ft height (office has old calendar on wall)	PBB, Phenol, Cyanide, TAL Metals

TABLE 3
Summary of Suspect Asbestos Containing Materials Collected During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Quantity of Suspect ACM (feet)	Presence (+)/ Absence (-) of ACM
Maint.-A	2331-024	1/26/98	Maint Bldg; on floor near W wall	2	+
Maint.-B	2331-025	1/26/98	Maint Bldg; on floor near E wall	2	-
Boiler Room-A	2331-022	1/26/98	Insul. on incinerator, E end of boiler room	Cylinder jacket 16 ft length x 2 ½ ft diameter	+
Bldg. 33-A	2331-002	1/26/98	Top of process Tank 69	Not Estimated	-
Bldg. 35-A	2331-015	1/26/98	Pipe insulation	25	+
Bldg. 35-B	2331-017	1/26/98	Pipe insulation	35	+
Bldg. 35-C	2331-018	1/26/98	On floor beneath tank at E end of bldg.	2	-
Bldg. 35-D	2331-019	1/26/98	Pipe insulation	120	+
Bldg. 35-E	2331-020	1/26/98	Pipe insulation	200	+
Bldg. 33-B	2331-028	1/26/98	2nd floor; N side of bldg., pipe insulation in laboratory	50	+

TABLE 3 (Cont'd)
Summary of Suspect Asbestos Containing Materials Collected During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Quantity of Suspect ACM (feet)	Presence (+)/ Absence (-) of ACM
Bldg. 34-A	2331-005	1/26/98	Bldg. 34; lower pipe	27	+
Bldg. 34-B	2331-007	1/26/98	Bldg. 34; upper pipe	52	+
Bldg. 34-C	2331-009	1/26/98	Bldg. 34; NW corner of bldg, on floor (process vessel insulation)	Not estimated	-
Bldg. 34-D	2331-011	1/26/98	Bldg. 34A; SW corner of bldg, on floor (pipe insulation)	2	+
Bldg. 34-E	2331-013	1/26/98	W end Bldg. 34; on floor between Tanks 88 & 89	Not estimated	-
Bldg. 34-F	2331-026	1/26/98	W end Bldg. 34; composite of insulation on Tanks 88 & 89	Not estimated	-

TABLE 4
Paint Chip Samples Collected for Lead Analysis During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Lead Conc. (mg/kg)	Weight of Paint per 100 cm^2 (g)	mg Lead/cm^2 of Paint Surface
Bldg. 33-A	2331-049	1/27/98	E end of bldg; inside door	10.8	9.8	0.001
Bldg. 33-B	2331-050	1/27/98	N side of bldg; 2nd floor	92.9	6.9	0.006
Bldg. 34-A	2331-051	1/27/98	W end of bldg; N wall	1,670	3.6	0.06
Bldg. 35-B	2331-052	1/27/98	Wall adjacent to 2nd floor staircase	1,510	9.8	0.15
Bldg. 35-A	2331-069	1/28/98	Inside wall near door; 1st floor	1,450	17.0	0.25

TABLE 5
Summary of Dioxin Positive Detections in Soil Collected During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Location	Depth (ft)	Sum of all Dioxin Using Toxicity Equiv. Factor (μg/kg)
WC-1	2331-035	N fence line	0-0.3	0.0058
WC-2	2331-036	Near NE corner of site	0-0.2	0.2867
WC-3	2331-037	Between Bldgs. 34 & 34A	0-0.2	0.0072
WC-4	2331-038	Near NE corner of Maint. Shop	0-0.2	2.2059
WC-5	2331-039	E of Maint. Shop in former Open Storage Area	0-0.2	0.0273
WC-6	2331-040	NE corner of Maint. Shop	0-0.2	0.0926
WC-7	2331-041	Tank Storage Area	0-0.2	0.0225
WC-8	2331-042	Tank Storage Area	0-0.2	0.0141
WC-9	2331-043	Tank Storage Area	0-0.2	0.0088
WC-10	2331-044	Between Boiler Room & Bldg. 33	0-0.2	0.0347
WC-11	2331-045	S of Bldg. 33	0-0.2	0.0420
WC-12	2331-046	Tank area S of Bldg. 35	0-0.2	0.0296

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TABLE 5 (Cont'd)
Summary of Dioxin Positive Detections in Soil Collected During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Location	Depth (ft)	Sum of all Dioxin Using Toxicity Equiv. Factor (μg/kg)
WC-13	2331-047	S end of tank area S of Bldg. 35	0-0.2	0.0199
WC-14	2331-048	E fence line	0-0.2	0.0114
Bldg. 33 Sump	2331-058	Bldg. 33 sump trough; composite	0-0.3	0.0102
Bldg. 34 Sump	2331-059	Bldg. 34 sump	0-0.5	0.0266
WC-15D	2331-060	Near NE corner of Bldg. 35	1-2	0.0078
Bldg. 34D1	2331-061	Outside S entrance of Bldg. 34	0.7-1.3	0.0085
Bldg. 34D2	2331-062	Outside S entrance of Bldg. 34	6-7	0.0043
WC-16D	2331-063	SE corner of Maint. Shop	4-5	0.0018
WC-3D1	2331-064	Between Bldg. 34 & 34A	0.6-1.5	0.0125
WC-3D2	2331-065	Between Bldg. 34 & 34A	7.5-8.5	0.0007

TABLE 6
Summary of Positive Detections for PBBs in Soil Collected During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Location	Depth (ft)	Sum of all PBBs (μg/kg)
WC-1	2331-035	N fence line	0-0.3	0.7
WC-2	2331-036	Near NE corner of site	0-0.2	23.24
WC-3	2331-037	Between Bldgs. 34 & 34A	0-0.2	124
WC-4	2331-038	Near NE corner of Maint. Shop	0-0.2	5,043
WC-5	2331-039	E of Maint. Shop in former Open Storage Area	0-0.2	796
WC-6	2331-040	NE corner of Maint. Shop	0-0.2	2,242
WC-7	2331-041	Tank Storage Area	0-0.2	4,131
WC-8	2331-042	Tank Storage Area	0-0.2	684.4
WC-9	2331-043	Tank Storage Area	0-0.2	1,060
WC-10	2331-044	Between Boiler Room & Bldg. 33	0-0.2	1,136
WC-11	2331-045	S of Bldg. 33	0-0.2	2839
WC-12	2331-046	Tank area S of Bldg. 35	0-0.2	623.5
WC-13	2331-047	S end of tank area S of Bldg. 35	0-0.2	2,168
WC-14	2331-048	E fence line	0-0.2	101

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TABLE 6 (Cont'd)
Summary of Positive Detections for PBBs in Soil Collected During the Phase I Investigation
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Location	Depth (ft)	Sum of all PBBs (μg/kg)
Bldg. 33 Sump	2331-058	Bldg. 33 sump trough; composite	0-0.3	362.5
Bldg. 34 Sump	2331-059	Bldg. 34 sump	0-0.5	322

TABLE 7
Semivolatile Organic Compounds in Soil Collected During the Phase I Investigation Exceeding Proposed NJDEP Criteria
Non-Residential Sites
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Location	Depth (ft)	Compound	Conc. (mg/kg)	NJDEP Cleanup Criterion (mg/kg)
Bldg. 33 Sump	2331-058	Bldg. sump trough; composite	0-0.3	Benzo(a)anthracene	4.6	4.0
"	"	"	"	Benzo(k)fluoranthene	8.9	4.0
"	"	"	"	Benzo(a)pyrene	4.6	0.66

TABLE 8
TAL Inorganics in Soil Collected During the Phase I Investigation That Exceed Proposed NJDEP Criteria
Non-Residential Sites
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Location	Depth (ft)	Compound	Conc. (mg/kg)	NJDEP Cleanup Criterion (mg/kg)
Bldg. 34D2	2331-062	Outside S entrance of Bldg. 34	6-7	Beryllium	1.4	1
WC-1	2331-035	N fence line	0-0.3	Lead	792	600
WC-2	2331-036	Near NE corner of site	0-0.2	Thallium	7.3	2
WC-3	2331-037	Between Bldgs. 34 & 34A	0-0.2	Antimony	383	340
WC-4	2331-038	Near NE corner of Maint. Shop	0-0.2	Copper	6,610	600
"	"	"	"	Lead	3,090	600
"	"	"	"	Thallium	2.9	2
WC-5	2331-039	E of Maint. Shop in former Open Storage Area	0-0.2	Thallium	2.6	2
WC-6	2331-040	NE corner of Maint. Shop	0-0.2	Antimony	446	340
"	"	"	"	Lead	1,000	600
"	"	"	"	Thallium	4.4	2

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TABLE 8 (Cont'd)
TAL Inorganics in Soil Collected During the Phase I Investigation That Exceed Proposed NJDEP Criteria
Non-Residential Sites
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Location	Depth (ft)	Compound	Conc. (mg/kg)	NJDEP Cleanup Criterion (mg/kg)
WC-10	2331-044	Between Boiler Room & Bldg. 33	0-0.2	Thallium	4.7	2
WC-11	2331-045	S of Bldg. 33	0-0.2	Thallium	3.4	2
WC-13	2331-047	S end of tank area S of Bldg. 35	0-0.2	Thallium	3.0	2
WC-14	2331-048	E fence line	0-0.2	Thallium	5.6	2
Bldg. 33 Sump	2331-058	Bldg. 33 sump trough; composite	0-0.3	Thallium	8.4	2

TABLE 9
Wipe Sampling Analytical Results from the Phase I Investigation - PBBs
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Total PBBs (µg/wipe)
Bldg. 34-A	2331-004	1/26/98	6 ft S of NW corner; 3 ft height	0.06
Bldg. 34-B	2331-006	1/26/98	24 ft N of SW corner on W wall; 3 ft height	0.102
Bldg. 34-C	2331-008	1/26/98	E wall Bldg. 34A; 18 ft from SE corner	0.007
Bldg. 34-D	2331-010	1/26/98	W end of bldg.; 23 ft N of S side; 4.5 ft height	0.131
Bldg. 34-E	2331-012	1/26/98	W end of bldg.; 10 ft from SW corner; 4 ft height	0.02
Maint.-A	2331-023	1/26/98	Center of W wall; below exhaust fan; 5 ft height	0.032
Boiler Room-A	2331-021	1/26/98	Boiler Room; 2 ft from SE corner; 3.5 ft height	Not detected
Bldg. 33-A	2331-001	1/26/98	Behind Tank 59; 32 ft W of E wall; 4 ft height	0.009
Bldg. 33-B	2331-003	1/26/98	2nd floor; 62 ft W of E wall; 20 ft height	0.402
Bldg. 35-A	2331-014	1/26/98	2nd floor; S wall, 2 ft from SE corner; 1.5 ft height	Not detected
Bldg. 35-B	2331-016	1/26/98	1st floor; 3rd section from E, N wall, 10 ft W of E wall; 2 ft height	Not detected
Bldg. 33-C	2331-027	1/27/98	N side of bldg.; S wall, in room identified by OHM Corp. as containing haz. materials; 2 ft height	Not detected
Bldg. 33-D	2331-031	1/27/98	N side of bldg.; 2nd floor lab; taken under hood	0.0203

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TABLE 9 (Cont'd)
Wipe Sampling Analytical Results from the Phase I Investigation - PBBs
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Total PBBs (μg/wipe)
Bldg. 33-E	2331-029	1/27/98	N side of bldg. on E end; 2nd floor lab; taken on wall adjacent to hood; 4 ft height	0.08
Bldg. 33-F	2331-030	1/27/98	1st floor office; N side of bldg.; 3 ft height (office has old calendar on wall)	Not detected

TABLE 10
Wipe Sampling Analytical Results from the Phase I Investigation - Total Phenols
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Total Phenols (μg/wipe)
Bldg. 34-A	2331-004	1/26/98	6 ft S of NW corner; 3 ft height	Not detected
Bldg. 34-B	2331-006	1/26/98	24 ft N of SW corner on W wall; 3 ft height	"
Bldg. 34-C	2331-008	1/26/98	E wall Bldg. 34A; 18 ft from SE corner	"
Bldg. 34-D	2331-010	1/26/98	W end of bldg.; 23 ft N of S side; 4.5 ft height	"
Bldg. 34-E	2331-012	1/26/98	W end of bldg.; 10 ft from SW corner; 4 ft height	0.0026
Maint.-A	2331-023	1/26/98	Center of W wall; below exhaust fan; 5 ft height	0.0039
Boiler Room-A	2331-021	1/26/98	Boiler Room; 2 ft from SE corner; 3.5 ft height	0.0028
Bldg. 33-A	2331-001	1/26/98	Behind Tank 59; 32 ft W of E wall; 4 ft height	Not detected
Bldg. 33-B	2331-003	1/26/98	2nd floor; 62 ft W of E wall; 20 ft height	"
Bldg. 35-A	2331-014	1/26/98	2nd floor; S wall, 2 ft from SE corner; 1.5 ft height	0.0042
Bldg. 35-B	2331-016	1/26/98	1st floor; 3rd section from E, N wall, 10 ft W of E wall; 2 ft height	Not detected
Bldg. 33-C	2331-027	1/27/98	N side of bldg.; S wall, in room identified by OHM Corp. as containing haz. materials; 2 ft height	0.0026
Bldg. 33-D	2331-031	1/27/98	N side of bldg.; 2nd floor lab; taken under hood	0.0035

TABLE 10 (Cont'd)
Wipe Sampling Analytical Results from the Phase I Investigation - Total Phenols
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Total Phenols (μg/wipe)
Bldg. 33-E	2331-029	1/27/98	N side of bldg. on E end; 2nd floor lab; taken on wall adjacent to hood; 4 ft height	0.004
Bldg. 33-F	2331-030	1/27/98	1st floor office; N side of bldg.; 3 ft height (office has old calendar on wall)	0.0028

TABLE 11
Wipe Sampling Analytical Results from the Phase I Investigation - Cyanide
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Cyanide (μg/wipe)
Bldg. 34-A	2331-004	1/26/98	Center of Bldg. 34; 6 ft S of NW corner,; 3 ft height	2.7
Bldg. 34-B	2331-006	1/26/98	Center of Bldg. 34, 24 ft N of SW corner on W wall; 3 ft height	0.29
Bldg. 34-C	2331-008	1/26/98	E wall Bldg. 34A; 18 ft from SE corner	7.6
Bldg. 34-D	2331-010	1/26/98	W end of bldg.; 23 ft N of S side; 4.5 ft height	0.5
Bldg. 34-E	2331-012	1/26/98	W end of bldg.; 10 ft from SW corner; 4 ft height	1.1
Maint.-A	2331-023	1/26/98	Center of W wall; below exhaust fan; 5 ft height	0.34
Boiler Room-A	2331-021	1/26/98	Boiler Room; 2 ft from SE corner; 3.5 ft height	Not detected
Bldg. 33-A	2331-001	1/26/98	Behind Tank 59; 32 ft W of E wall; 4 ft height	"
Bldg. 33-B	2331-003	1/26/98	2nd floor; 62 ft W of E wall; 20 ft height	0.63
Bldg. 35-A	2331-014	1/26/98	2nd floor; S wall, 2 ft from SE corner; 1.5 ft height	0.54
Bldg. 35-B	2331-016	1/26/98	1st floor; 3rd section from E, N wall, 10 ft W of E wall; 2 ft height	0.59
Bldg. 33-C	2331-027	1/27/98	N side of bldg.; S wall, in room identified by OHM Corp. as containing haz. materials; 2 ft height	0.26
Bldg. 33-D	2331-031	1/27/98	N side of bldg.; 2nd floor lab; taken under hood	Not detected

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TABLE 11 (Cont'd)
Wipe Sampling Analytical Results from the Phase I Investigation - Cyanide
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Cyanide (μg/wipe)
Bldg. 33-E	2331-029	1/27/98	N side of bldg. on E end; 2nd floor lab; taken on wall adjacent to hood; 4 ft height	Not detected
Bldg. 33-F	2331-030	1/27/98	1st floor office; N side of bldg.; 3 ft height (office has old calendar on wall)	"

TABLE 12
Wipe Sampling Analytical Results from the Phase I Investigation - Mercury
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Mercury (μg/wipe)
Bldg. 33-B	2331-003	1/26/98	2nd floor; 62 ft W of E wall; 20 ft height	1.6
Bldg. 34-B	2331-006	1/26/98	24 ft N of SW corner on W wall; 3 ft height	0.14

TABLE 13
Wipe Sampling Analytical Results from the Phase I Investigation -TAL Metals
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Analytical Results (μg/wipe)
Bldg. 34-A	2331-004	1/26/98	6 ft S of NW corner; 3 ft height	Sb(340);Cr(19);Cu(9);Tl(2);V (2);Zn(49);As(2);Pb(3)
Bldg. 34-B	2331-006	1/26/98	24 ft N of SW corner on W wall; 3 ft height	Analyzed for Hg only (see Table 12)
Bldg. 34-C	2331-008	1/26/98	E wall Bldg. 34A; 18 ft from SE corner	Sb(298);Cr(92);Cu(1030);Tl (8);V(142);Zn(5000);As(10); Pb(2300); Cd (3)
Bldg. 34-D	2331-010	1/26/98	W end of bldg.; 23 ft N of S side; 4.5 ft height	Sb(266);Cr(176);Cu(240);Tl (3);V(6);Zn(341);As(17); Pb(72); Cd(0.3)
Bldg. 34-E	2331-012	1/26/98	W end of bldg.; 10 ft from SW corner; 4 ft height	Sb(151);Cr(36);Cu(57);Tl (2);V(4);Zn(196);As(1); Pb(64); Cd(0.4)
Maint.-A	2331-023	1/26/98	Center of W wall; below exhaust fan; 5 ft height	Sb(202);Cr(162);Cu(129);Tl (1);V(14);Zn(82100);As(10); Pb(1070); Cd(23)
Boiler Room-A	2331-021	1/26/98	Boiler Room; 2 ft from SE corner; 3.5 ft height	Sb(88);Cr(81);Cu(16);V(8); Zn(183);As(6);Pb(17); Cd(0.3)

TABLE 13 (Cont'd)
Wipe Sampling Analytical Results from the Phase I Investigation -TAL Metals
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Analytical Results (μg/wipe)
Bldg. 35-A	2331-014	1/26/98	2nd floor; S wall, 2 ft from SE corner; 1.5 ft height	Sb(118);Cr(114);Cu(176);Tl (2);V(68);Zn(3000);As(6);Pb(2300); Cd (3)
Bldg. 33-A	2331-001	1/26/98	Behind Tank 59; 32 ft W of E wall; 4 ft height	Sb(103);Cr(16);Cu(46); V(5);Zn(80);As(3);Pb(14)
Bldg. 35-B	2331-016	1/26/98	1st floor; 3rd section from E, N wall, 10 ft W of E wall; 2 ft height	Sb(85);Cr(26);Cu(56);V(8); Zn(3510);As(2);Pb(389); Cd (5)
Bldg. 33-C	2331-027	1/27/98	N side of bldg.; S wall, in room identified by OHM Corp. as containing haz. materials; 2 ft height	Sb(111);Cr(6);Cu(11);V(1); Zn(168);As(1);Pb(25); Cd (0.7)
Bldg. 33-D	2331-031	1/27/98	N side of bldg.; 2nd floor lab; taken under hood	Sb(142);Cr(308);Cu(22);V(5) Zn(184);As(2);Pb(39); Cd (0.7)
Bldg. 33-E	2331-029	1/27/98	N side of bldg. on E end; 2nd floor lab; taken on wall adjacent to hood; 4 ft height	Sb(164);Cr(4);Cu(9);Zn(81); Pb(79); Cd (0.3)
Bldg. 33-F	2331-030	1/27/98	1st floor office; N side of bldg; 3 ft height (office has old calendar on wall)	Sb(118);Cr(35);Cu(7); Zn(159);Pb(37)
Bldg. 33-B	2331-003	1/26/98	2nd floor; 62 ft W of E wall; 20 ft height	Analyzed for Hg only (see Table 12)

TABLE 14
Summary of Soil Samples Collected During the Phase II Investigation for Dioxin, PBBs, PCBs, BNAs & TAL Metals[1]
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Depth (ft)	Analysis
SB-1	2331-071	3/16/98	Near N corner of site	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-2	2331-076	3/16/98	Near NW corner Bldg. 34	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-3	2331-081	3/16/98	Near NE corner of site	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-4	2331-086	3/16/98	Near E fence line	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-5	2331-091	3/16/98	E of Maint. Shop	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-6	2331-096	3/16/98	Inside Bldg. 34	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-7	2331-101	3/16/98	Inside Bldg. 34 (W end)	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-8	2331-106	3/16/98	Between Bldg. 34 and Tank Storage Area	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-9	2331-111	3/17/98	Inside Bldg. 33	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-10	2331-116	3/17/98	Tank Storage Area	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-11	2331-121	3/17/98	E of Bldg. 35	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-12	2331-126	3/17/98	E of Bldg. 35	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-13	2331-131	3/17/98	Near SE corner of site	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-14	2331-136	3/17/98	SW corner of Bldg. 34	0-2	Dioxin, PBB, PCB, BNA,TAL metals
SB-15	2331-141	3/17/98	SW corner of Bldg. 33	0-2	Dioxin, PBB, PCB, BNA,TAL metals

[1]Samples listed in table were collected from 0-2 feet bgs. Samples were also collected at 2-foot increments to a depth of 10 feet; these samples will only be analyzed if samples from 0-2 feet bgs exceed proposed NJDEP soil cleanup standards for industrial property.

TABLE 15
Summary of Soil Samples Collected During the Phase II Investigation for VOCs
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Date Collected	Location	Depths (ft)	Analysis
SB-1	2331-071, 075	3/16/98	Near N corner of site	0-2; 8-10	VOCs
SB-2	2331-076, 080	3/16/98	Near NW corner Bldg. 34	0-2; 8-10	VOCs
SB-3	2331-081, 085	3/16/98	Near NE corner of site	0-2; 8-10	VOCs
SB-4	2331-086, 090	3/16/98	Near E fence line	0-2; 8-10	VOCs
SB-5	2331-091, 095	3/16/98	E of Maint. Shop	0-2; 8-10	VOCs
SB-6	2331-096, 100	3/16/98	Inside Bldg. 34	0-2; 8-10	VOCs
SB-7	2331-101, 105	3/16/98	Inside Bldg. 34 (W end)	0-2; 8-10	VOCs
SB-8	2331-106, 108, 110	3/16/98	Between Bldg. 34 and Tank Storage Area	0-2; 4-6; 8-10	VOCs
SB-9	2331-111, 115	3/17/98	Inside Bldg. 33	0-2; 8-10	VOCs
SB-10	2331-116, 117, 118, 119, 120	3/17/98	Tank Storage Area	0-2; 2-4; 4-6; 6-8; 8-10	VOCs
SB-11	2331-121, 125	3/17/98	E of Bldg. 35	0-2; 8-10	VOCs
SB-12	2331-126, 130	3/17/98	E of Bldg. 35	0-2; 8-10	VOCs
SB-13	2331-131, 135	3/17/98	Near SE corner of site	0-2; 8-10	VOCs
SB-14	2331-136, 140	3/17/98	SW corner of Bldg. 34	0-2; 8-10	VOCs
SB-15	2331-141, 142, 145	3/17/98	SW corner of Bldg. 33	0-2; 2-4; 8-10	VOCs

TABLE 16
Summary of Dioxin Positive Detections in Soil Collected During the Phase II Investigation
White Chemical Site
Newark, NJ
April 1998

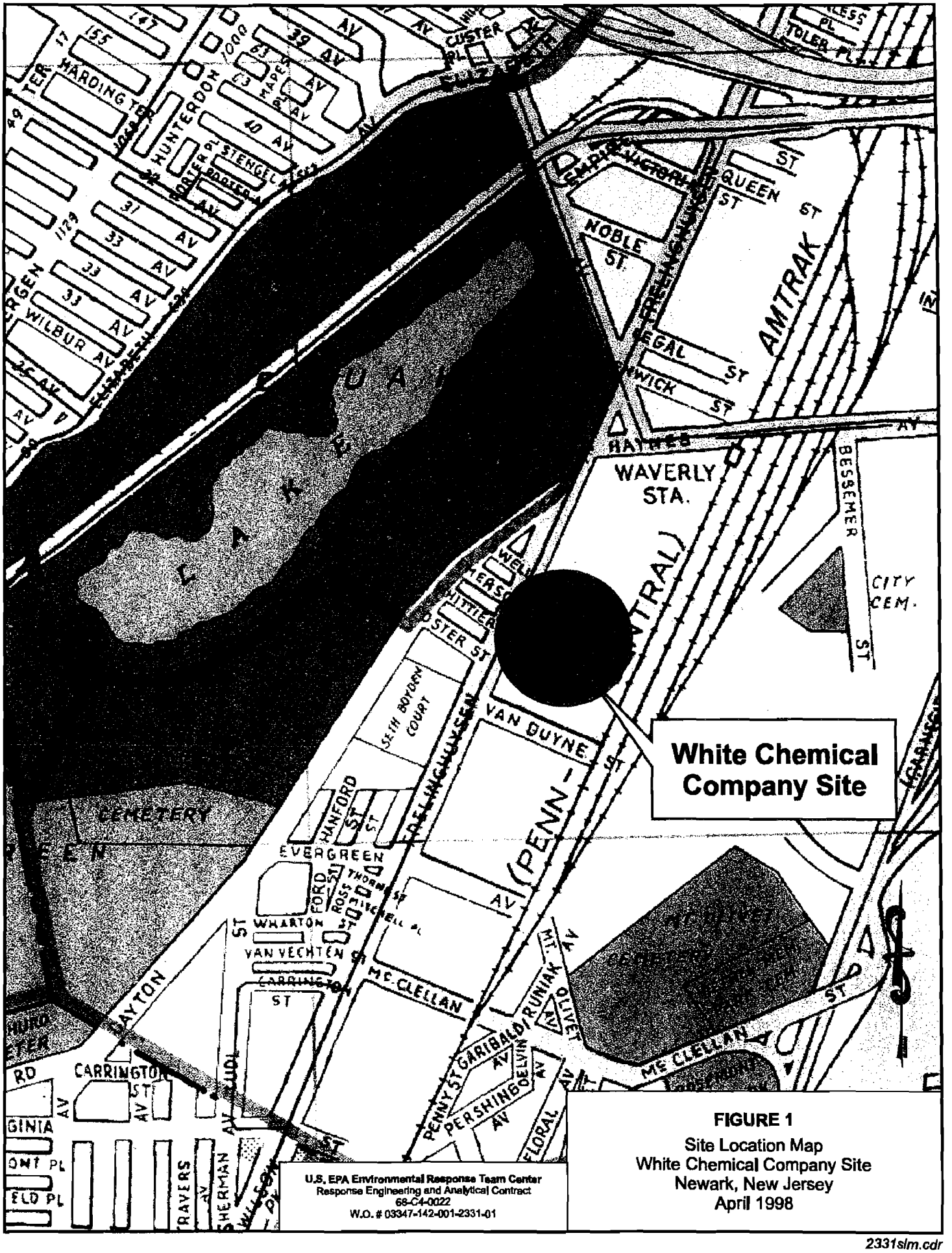
Location Number	Sample Number	Location	Depth (ft)	Sum of all Dioxin Using Toxicity Equiv. Factor (μg/kg)
SB-1	2331-071	Near N corner of site	0-2	0.0384
SB-3	2331-081	Near NE corner of site	0-2	0.0031
SB-4	2331-086	Near E fence line	0-2	0.0606
SB-5	2331-091	E of Maint. Shop	0-2	0.0788
SB-6	2331-096	Inside Bldg. 34	0-2	0.0775
SB-7	2331-101	Inside Bldg. 34 (W end)	0-2	0.0950
SB-8	2331-106	Between Bldg. 34 and Tank Storage Area	0-2	0.0393
SB-9	2331-111	Inside Bldg. 33	0-2	0.2259
SB-10	2331-116	Tank Storage Area	0-2	0.0168
SB-11	2331-121	E of Bldg. 35	0-2	0.0939
SB-12	2331-126	E of Bldg. 35	0-2	0.0074
SB-13	2331-131	Near SE corner of site	0-2	0.0077
SB-14	2331-136	SW corner of Bldg. 34	0-2	0.0820
SB-15	2331-141	SW corner of Bldg. 33	0-2	0.0069

TABLE 17
Semivolatile Organic Compounds in Soil Collected During the Phase II Investigation Exceeding Proposed NJDEP Criteria
Non-Residential Sites
White Chemical Site
Newark, NJ
April 1998

Location Number	Sample Number	Location	Depth (ft)	Compound	Conc. (mg/kg)	NJDEP Cleanup Criterion (mg/kg)
SB-10	2331-116	Adjacent to tank farm area	0-2	Indeno(1,2,3-cd)pyrene	10	4
"	"	"	"	Benzo(a)anthracene	12	4
"	"	"	"	Benzo(a)pyrene	12	0.66
SB-11	2331-121	Adjacent to Building 35	0-2	Benzo(a)anthracene	16	4
"	"	"	"	Benzo(a)pyrene	15	0.66
"	"	"	"	Benzo(k)fluoranthene	7.6	4

TABLE 18
TAL Inorganics in Soil Collected During the Phase II Investigation That Exceed Proposed NJDEP Criteria
Non-Residential Sites
White Chemical Site
Newark, NJ
April 1998

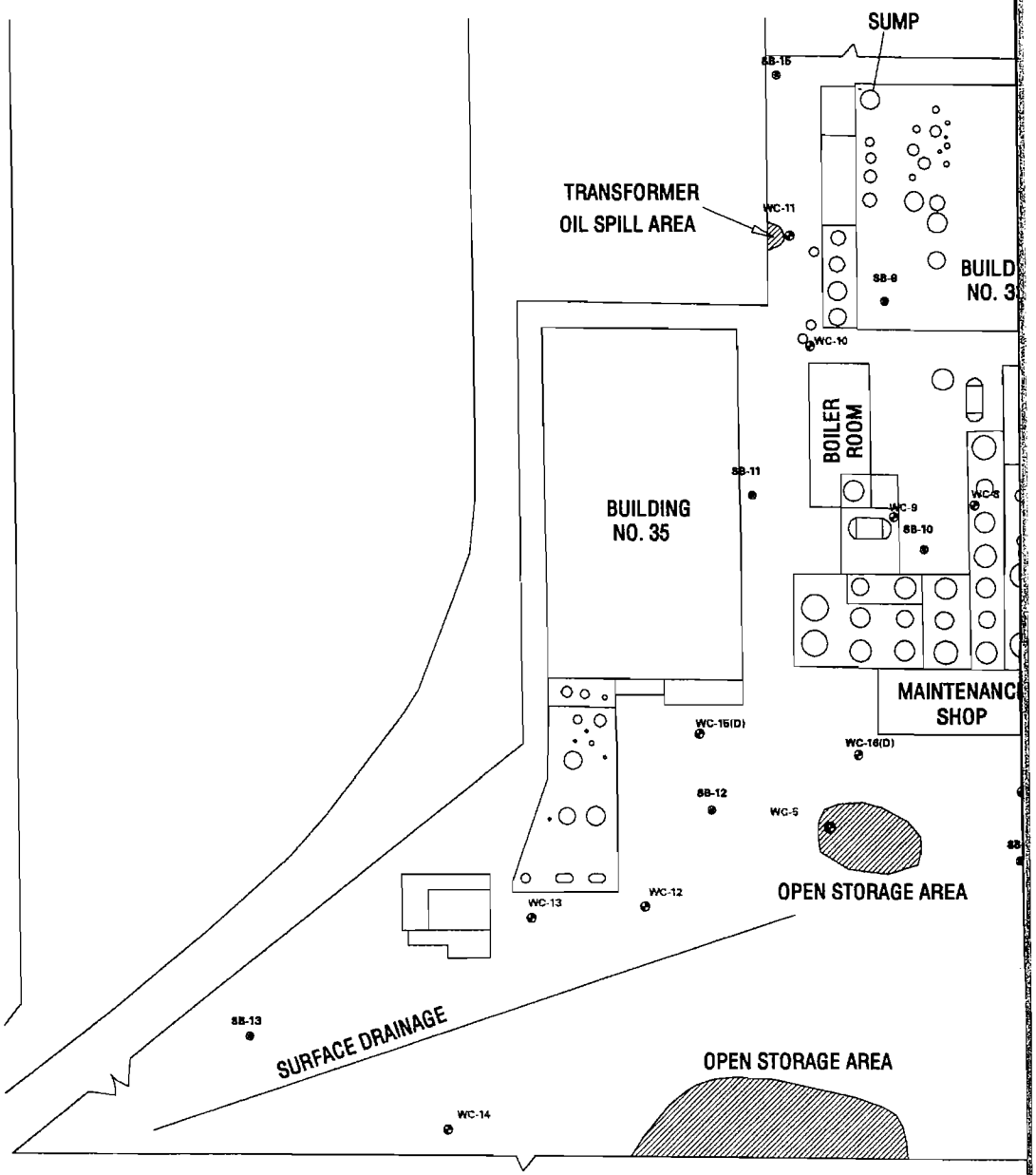
Location Number	Sample Number	Location	Depth (ft)	Compound	Conc. (mg/kg)	NJDEP Cleanup Criterion (mg/kg)
SB-9	2331-111	Beneath pavement floor, SE corner, Bldg. 33	0-2	Lead	1940	600
"	"	"	"	Zinc	5490	1500
SB-15	2331-141	Near SW corner of Building 33	0-2	Lead	905	600
"	"	"	"	Zinc	3570	1500



U.S. EPA Environmental Response Team Center
Response Engineering and Analytical Contract
68-C4-0022
W.O. # 03347-142-001-2331-01

FIGURE 1
Site Location Map
White Chemical Company Site
Newark, New Jersey
April 1998

2331slm.cdr



GRAPHIC SCALE

50 0 25 50 100

1 inch = 50 ft.

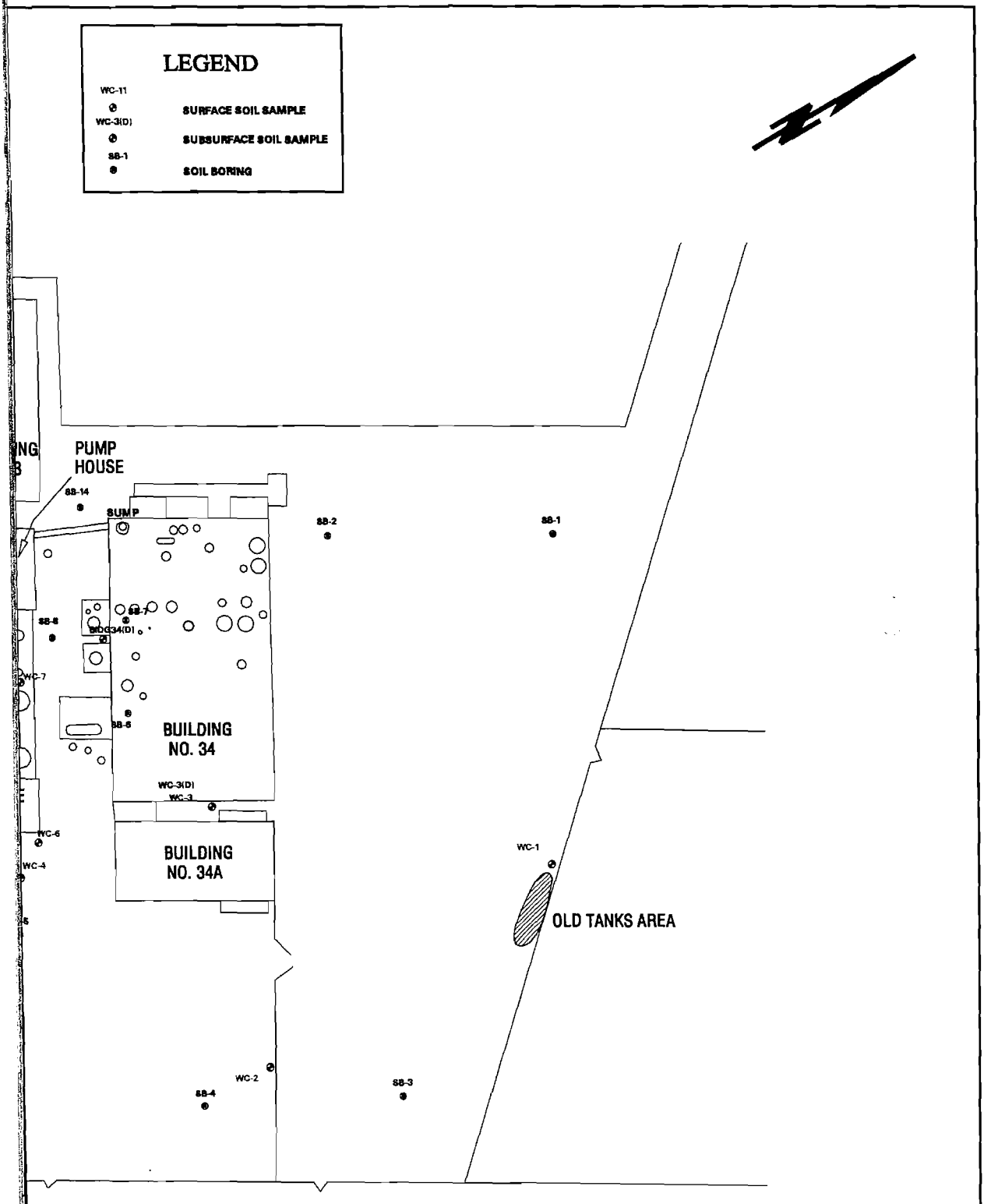


FIGURE 2

SOIL SAMPLE LOCATION MAP
WHITE CHEMICAL CORPORATION
NEWARK, NEW JERSEY
APRIL 1998

U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C4-0022
W.O.# 03347-142-001-2331-01

The Port Authority of NY & NJ
New York, New York

SUMMARY REPORT
OF
ENVIRONMENT ASSESSMENT AND
TREATABILITY PROGRAM
FOR
PERIPHERAL DITCH SEDIMENTS
AT
NEWARK INTERNATIONAL AIRPORT

ATTACHMENT I
VOLUME 1
ANALYTICAL LABORATORY DATA REPORTS

October 1991

W.O. No. 2527-35-01

Prepared by:
Roy F. Weston, Inc.
1 Raritan Plaza
Raritan Center - 4th Floor
Edison, New Jersey 08837

BAG000001

WESTON-GULF COAST LABORATORIES, INC.
2417 Bond St., University Park, Illinois 60466
Phones: (708) 534-5200 (219) 885-7077 (815) 723-7533

July 31, 1991

Mr. Joe Tordonne
Roy F. Weston, Incorporated
254 Welsh Pool Road
Lionville, PA 19353

Dear Mr. Tordonne:

Please find enclosed the analytical report for the samples submitted to Weston/Gulf Coast Laboratories for analyses. They were identified as follows:

PROJECT: **Port Authority of NY&NJ**

RFW BATCH #: **9106G878**

If you have any further questions, please contact our laboratories.

Sincerely,

WESTON/GULF COAST LABORATORIES

Michael J. Healy
Laboratory Manager

Eric A. Lang
Project Manager

cdw

Enclosures

cc:Bob Harris

IDENTIFICATION & CLASSIFICATION

of the

TRIBUTARY DISCHARGES

to

PERIPHERAL DITCH

Newark International Airport
Newark, New Jersey

June 1995

Prepared For:

THE PORT AUTHORITY OF NY & NJ
One World Trade Center
New York, New York

Prepared by:

KILLAM ASSOCIATES
Consulting Engineers
27 Bleeker Street
Millburn, New Jersey

BAG000002

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Table 12 - Elizabeth DMRs for Alina CSO

EXECUTIVE SUMMARY

The Port Authority of NY & NJ (Port Authority) is preparing to undertake the maintenance dredging of the peripheral ditch at the Newark International Airport. In relation to that project, the Port Authority has retained Killam Associates (Killam) to identify and characterize the discharges which are tributary to the peripheral ditch in order to develop an understanding of the potential sources of pollutants which are found in the peripheral ditch's sediments. This is an important issue in the context of the cost of sediment disposal.

Killam's investigation included the delineation and assessment of the drainage basin of the peripheral ditch (the "study area"), the identification of permitted industrial discharges within the study area, the compilation of information regarding the discharges of specific industrial users which have or may have the potential to impact the peripheral ditch, the performance of a limited site inspection of the peripheral ditch, an assessment of urban and roadway runoff, and an evaluation of the data generated. This investigation was limited to the review of readily available files provided by the government and private agencies and permitted discharges. The presence of illegal, non-permitted and/or non-industrial discharges was not evaluated or identified as part of this study. Further, this investigation did not include any sampling or testing (e.g., air, water or soil). The study was structured to identify and evaluate potential off-site contaminant sources which have impacted the sediment quality in the peripheral ditch.

The Port Authority has indicated that the pollutants of concern noted in the sediments of the peripheral ditch during a previously conducted study include total petroleum hydrocarbons (TPHC), polychlorinated biphenyls (PCBs), lead, pH, polynuclear aromatic hydrocarbons (PAHs), and benzene, toluene, ethylbenzene and xylenes (BTEX). Based on the sources consulted and the research undertaken for the purposes of this study, numerous contributors to the sediment quality in the peripheral ditch have been identified. These include indirect

and direct industrial discharges, contaminated sites and urban/highway runoff. This report summarizes the study of potential contributing sources.

The study identified six combined sewer overflow systems (CSOs) which discharge to the peripheral ditch or its tributaries and which represent a potential source of contaminants which can accumulate in the ditch. The overall quantity and quality of these CSO discharges cannot be assessed, due to lack of monitoring data regarding same.

Industrial facilities discharging process wastewater to the combined sewerage system represent another source of contaminants. Review of records for many facilities within the study area with permits to discharge to the system indicates a number of these facilities have reported violations of permit limitations for petroleum hydrocarbons, which is a contaminant of concern in the peripheral ditch. Findings imply that these industrial discharges may significantly contribute to the presence of contaminants in the ditch. Additionally, numerous facilities within the study area were identified as permitted direct and indirect dischargers to the surface water system. Periodic permit violations were noted. These direct and indirect discharges do contribute contaminants of concern to the ditch system, and the accumulation of these contaminants over time is likely to have been a factor in present sediment quality.

Finally, an evaluation of known contaminated sites and known discharge incidents has revealed the presence of over one hundred sites and incidents. While the quantification of the contribution of these sites is not feasible, the collective impact from these sites may represent a probable source. Further, runoff from roadways and other paved surfaces is likely to be a major contributor to the present sediment quality. The areas tributary to the ditch are highly urbanized and industrialized, and are intersected by numerous, well-traveled highways. The presence of petroleum hydrocarbons and other contaminants in highway runoff is well documented.

In summary, this study has identified the presence of numerous contributors to the sediment quality in the peripheral ditch. These include indirect and direct industrial discharges, contaminated sites, and urban/highway runoff. The collective impact of all of these sources has certainly had a significant impact on the observed sediment quality. It is also likely that contaminants found in the sediments today are the result of historic discharges which are, over time, moving through the surface water system.

1. INTRODUCTION

The Port Authority of NY & NJ (Port Authority) is responsible for the maintenance of the peripheral ditch at Newark International Airport (Airport), including the periodic dredging of accumulated sediments. To address concerns over the accumulation of contaminants in these sediments, the Port Authority has retained Killam Associates (Killam) to identify and characterize the industrial and/or other potential pollutant discharges which are tributary to the peripheral ditch. In prior studies, the Authority has identified several pollutants of concern in the sediments, including total petroleum hydrocarbons (TPHC), polychlorinated biphenyls (PCBs), lead, polynuclear aromatic hydrocarbons (PAHs) and benzene, toluene, ethylbenzene, and xylenes (BTEX). The intent of this study is to evaluate contributory pollutant sources beyond the airport itself.

The first task in this project involved the identification of drainage basin which contributes surface water flow to the ditch. The identification of the drainage basin is complicated by the presence of storm sewers and combined sewers, which can transport stormwater and sewage across natural basin divides. Therefore, this task involved a review of the combined sewer systems and also the separate sanitary and storm sewer systems within Newark, Elizabeth and Hillside. In addition, as-built engineering drawings of the applicable sections of the New Jersey Turnpike, North Avenue, Route 1 & 9, Route 22 and Route 78 were also reviewed for the evaluation of stormwater runoff. This identification included the mapping and calculation of the land area associated with the overall drainage basin and each sub-basin.

The drainage basin associated with the peripheral ditch encompasses approximately 10 square miles and contains numerous individual discharge sources. The number of industries discharging process waste within the drainage basin is also significant. However, the majority of these discharges are collected by combined sanitary sewer systems. Combined

sewers in Newark discharge to the Passaic Valley Sewerage Commissioners (PVSC) sewerage treatment plant. In Elizabeth, the combined sewers discharge to the Joint Meeting of Essex and Union Counties (Joint Meeting) sewerage treatment plant. Newark has five combined sewer overflows (CSOs) that have the potential to discharge to the peripheral ditch. The combined sewer system in Elizabeth has one overflow that can discharge to the ditch.

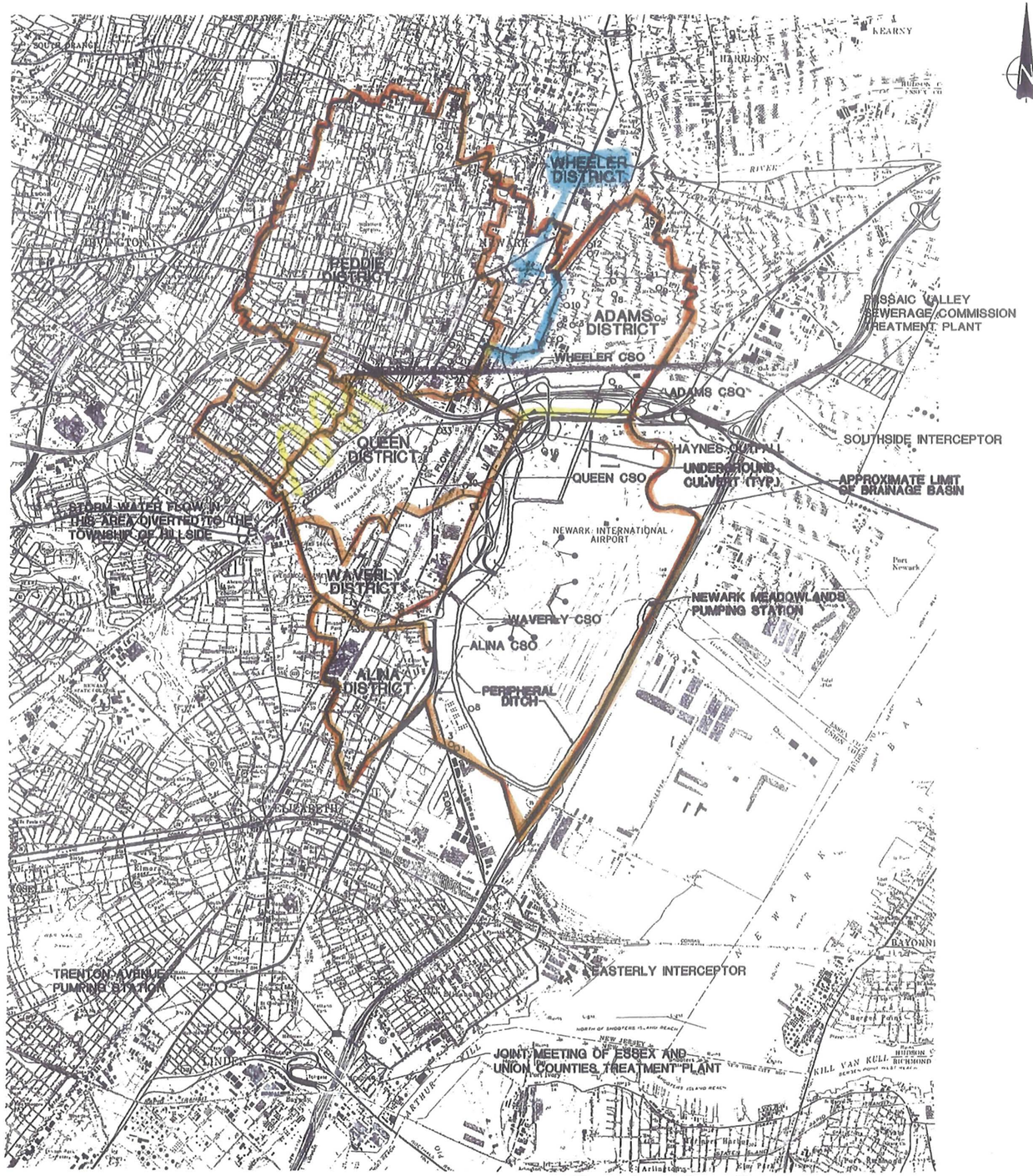
The second task in this project included the identification of the potential pollutant sources (i.e. discharges) within the peripheral ditch drainage basin. The discharges which were evaluated include permitted industrial discharges to combined sewers, industrial discharges to surface water, and indirect discharges (i.e. contaminated groundwater recharge). Killam's identification of known discharges within the study was based on a review of the following sources:

- PVSC - Industrial Inventory
- Joint Meeting - Industrial Inventory
- NJPDES Discharge to Surface Water Permits
- NJPDES Stormwater Permits
- NJPDES Discharge to Groundwater Permits
- New Jersey Department of Environmental Protection (NJDEP) Known Contaminated Sites of New Jersey
- United States Environmental Protection (USEPA) Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) and the National Priorities List (Also known as Superfund)
- USEPA Emergency Response Notification System

The initial list of potential discharges within the drainage basin was further evaluated in order to identify those which were most significant, with respect to pollutant contribution. These discharges included CSOs and NJPDES point and non-point source discharges. Killam reviewed permits issued by PVSC, Joint Meeting and the NJDEP (inclusive of Discharges to Surface Water and Stormwater Runoff). Killam attempted to identify the industrial discharges to the study area by name, permit number, location, SIC Code, approximate flow, permit requirements and permit limitations. Following the evaluation of this data, Killam compiled additional information (obtained from Discharge Monitoring Reports) on specific industrial discharges that are likely to be discharging to the ditch.

As part of this study, Killam also conducted two site inspections of the peripheral ditch. The purpose of the site inspections was to inspect those known discharges and tributaries entering the peripheral ditch as reported to Killam by the Port Authority. In addition, Killam attempted to identify undocumented sources (i.e. non-permitted and/or not previously identified discharges). During the site inspections, Killam also interviewed airport personnel involved with the general maintenance of the peripheral ditch for details regarding same. The site inspections were performed on November 15, 1994 and December 13, 1994. Observations and information conveyed by airport personnel during these site inspections are included in this report.

This investigation was limited to the review of readily available files provided by government and/or private agencies. This investigation did not include any sampling or testing (e.g. air, water, or soil).



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LEGEND

- APPROXIMATE LIMIT OF DRAINAGE BASIN
- APPROXIMATE LIMIT OF SEWER DISTRICT
- APPROXIMATE LOCATION OF SEWER INTERCEPTOR
- ▲ APPROXIMATE LOCATION OF COMBINED SEWER OVERFLOW (CSO)
- O_{28} PASSAIC VALLEY SEWERAGE COMMISSION SITE – VIOLATIONS NOTED
- O_{30} PASSAIC VALLEY SEWERAGE COMMISSION SITE – NO VIOLATIONS NOTED
- O_{2} JOINT MEETING OF ESSEX AND UNION COUNTIES SITE – NO VIOLATIONS NOTED

CSOs WITHIN NEWARK

OUTFALL NAME	TOTAL NUMBER OF INDUSTRIAL USERS	NUMBER OF INDUSTRIAL USERS DISCHARGING PROCESS WASTE	PRE-OVERFLOW CAPACITY (MGD) (1)	AVG. FLOW CONTAINING PROCESS WASTE (MGD) (2)	% (3)
ADAMS	15	9	7.8	1.24	16%
WHEELER	1	1	8.3	0.01	< 1%
PEDDIE	9	5	41.9	0.03	< 1%
QUEEN	6	5	20.0	0.025	< 1%
WAVERLY	8	3	26.0	0.84	3%
CSOs WITHIN ELIZABETH					
ALINA	4	1	(4)	0.120	– –

(1) – PRE-OVERFLOW CAPACITY REPORTED FOR THE SEWER DISTRICT.
(2) – AVERAGE DAILY FLOW FROM INDUSTRIAL FACILITIES DISCHARGING COMBINED SANITARY AND PROCESS WASTE.
(3) – % OF AVERAGE DAILY FLOW FROM INDUSTRIAL FACILITIES DISCHARGING COMBINED SANITARY & PROCESS WASTE VS. PRE-OVERFLOW CAPACITY.
(4) – VALUE WAS NOT AVAILABLE.

COMBINED SEWER OVERFLOWS
OUTFALL SIZES AND TRIBUTARY AREAS

OUTFALL NUMBER	OUTFALL NAME	OUTFALL DIMENSIONS (INCHES) (DIAMETER OF HEIGHT x WIDTH)	TRIBUTARY AREA (ACRES) COMBINED	TRIBUTARY AREA (ACRES) SEPARATE SANITARY	TOTAL AREA OF[4] DISTRICT (ACRES)
023	ADAMS	48 x 144	284	– –	852
024–030	WHEELER/AVE. A	TWO (2) 42 x 60	320	122[2]	320
025	PEDDIE	FOUR (4) 72 x 96	1,770[3]	– –	1,770
026	QUEEN	THREE (3) 54 x 75	209	458	1127
027–029	WAVERLY	90 AND 48	266	– –	442
001	ALINA	48	289	119	408
028	HAYNES[1]	57	– –	– –	48

(1) – PERMITTED STORMWATER OUTFALL
(2) – INCLUDES 122 ACRES OF SEPARATE SANITARY FLOW DIVERTED FROM THE SHERMAN AVENUE SEWER DISTRICT
(3) – INCLUDES 122 ACRES OF SEPARATE STORMWATER FLOW DIVERTED FROM THE SHERMAN AVENUE SEWER DISTRICT
(4) – TOTAL AREA OF SEWER DISTRICT IS NOT REPRESENTATIVE OF THE TRIBUTARY AREA TO THE CSO

FIGURE 1

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

Killam Associates

NEW JERSEY STATE DEPARTMENT OF HEALTH
STREAM POLLUTION CONTROL PROGRAM
EXAMINING ENGINEER'S REPORT

S-9-64-1742
September 9, 1964

Municipality.....City of Newark

County.....Essex

Organization.....Mayor and Council

Owners and Operators.....City of Newark

Location of Project.....Waverly, Queen and Peddie districts in South Side of City of Newark

Engineers.....Elson T. Killam Associates
Millburn, New Jersey
Mr. Elson T. Killam N. J. License # 3105

Subject.....Proposed construction of South Side Interceptor Sewer

Application.....Dated August 26, 1964 and signed by Mr. Ralph S. Caper Director of Public Works

Authority.....Resolution of Municipal Council adopted February 5, 1964

Estimated Cost.....$7,000,000.00

Source of Information

1. Application dated August 26, 1964, received September 8, 1964
2. Engineer's Report dated April 28, 1964 - 1 copy
3. Supplementary Engineer's Report dated August 26, 1964 - 1 copy
4. Specifications for South Side Interceptor Sewer dated July, 1964 - 1 copy
5. Plans of South Side Interceptor Sewer dated July, 1964 - 1 copy
6. Letter to Engineer from Department dated May 1, 1964

Disposal of Raw Sewage

To Passaic Valley Sewerage Commissioners Treatment Plant

Receiving Waters of Treated Waste

New York Bay

Basis of Design

It is proposed to construct an interceptor sewer to collect the combined sewage from

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three districts in the south side of Newark and to discharge same into the sanitary sewer of the Passaic Valley Sewerage Commissioners near its treatment plant on Wilson Avenue. The sewage is presently discharged untreated into ditches leading to Newark Bay.

The three districts known as Waverly, Queen and Peddie have the following characteristics:

	Area Available	Population	Dry Weather Flow			Interceptor	Ratio
		Present	Present		Estimated Future Cumul.	Capacity	Capacity to Future Flow
Waverly	325 acres	5,300	1510 gpcpd	8.2 mgd	11.3 mgd	29.0 mgd	2.57
Queen	549 acres	19,000	263 gpcpd	5.0 mgd	18.3 mgd	49.0 mgd	2.68
Peddie	1529 acres	112,000	159 gpcpd	18.0 mgd	40.0 mgd	80.0 mgd	2.00

It may be noted that Waverly and Queen are predominately industrial while Peddie is largely residential. The Waverly and Queen sewage wastes are highly concentrated with high BOD and suspended solids; the Peddie sewage is domestic. The Waverly sewage is said to be 33% stronger than Peddie; Queen sewage is 2.1 times stronger than Peddie. Consequently, it is proposed to provide greater sewer capacity in the industrial reaches so as to intercept a larger proportion of such sewage for disposal in the treatment plant. Hence, the larger ratios in these two districts of capacity to dry weather flow.

The existing combined sewerage system has capacity far in excess of the dry weather sanitary sewage flow. Waverly 30 to 1; Queen 25.1 and Peddie 90 to 1. Consequently it will be necessary to discharge the excess storm water to ditches leading to Newark Bay from regulator gates at each district outlet. It is proposed to install a slide gate, regulator with adjustable orifice and Venturi flume at each outlet. The regulator equipment is automatically float controlled. During storm flow, the adjustable orifice admits a portion of the flow to the interceptor sewer through a Venturi flume. There is a flow recorder on the upstream side of the Venturi and a water level recorder on the downstream side.

The main storm water flow passes out to a ditch through large rectangular orifices with sill about 4' above the invert of the channel carrying the dry weather sewage flow. Tide gates are attached to these orifices to prevent backflow into the interceptor from temporarily flooded ditches.

The Venturi flume will record the total volume diverted to the interceptor at the outlet of each district. The sum of the three Venturi readings will be the grand total of sewage entering the Passaic Valley treatment plant. The Venturi flume with tapered section and free water surface is believed to be the most practicable measuring device under the conditions of occasional heavy grit load.

The sewer will consist of reinforced concrete pipe, Classes III and V, with rubber and

steel joints. About 625' of 84" and 60" sewer will be constructed in tunnel under several railroads. There are also several ditch crossings and highway crossings including one of the New Jersey Turnpike.

There will also be provided sewage regulator, tide gates, and metering equipment at three principal junctions. One 84" motor operated sluice gate will be furnished and installed at the junction with the Passaic Valley Sewerage Commissioners main trunk sewer.

Sanitary Sewer Alignment

Location	From	To
ROW	Existing PVSC trunk	Manhole 1
Delancey Street	Manhole 1	Drop Manhole 2
ROW	Drop Manhole 2	Manhole 4
ROW	Manhole 4	Manhole 8
ROW	Manhole 8	Drop Manhole 9
ROW	Drop Manhole 9	Manhole 13
ROW	Manhole 13	Peddie Junction
ROW	Peddie Junction	Queen Junction
ROW	Queen Junction	Waverly Junction
ROW	Waverly Junction	Existing Manhole 26
ROW	Peddie Junction	Peddie Regulator

Footage	Diameter	Type	Minimum Grade
14,464'	84"	RCP	0.038%
1,831'	66"	RCP	.05%
705'	60"	RCP	.06%
5,294'	54"	RCP	.05%
930'	36"	RCP	.067%

Maximum Manhole Spacing	Manholes
1,900'	31

Joints: Manufacturer's Standard

Discussion

Although the distance between manholes exceeds the 500' distance required by our Rules and Regulations, the diameter of this interceptor is very large, from 54" to 84" in the main reaches, consequently, it would be easily possible for a man to walk through the sewer for maintenance purposes. Under these circumstances, it is believed that the 500' distance requirement may be waived with safety.

Diversion Facilities

Three reinforced concrete diversion facilities are to be constructed at Waverly, Queen and Peddie junctions.

Each facility will provide a control slide gate on the inlet, a Brown & Brown sewage regulator with adjustable orifice and a Venturi flume with recorder and water level gauge.

The excess storm flow will discharge through large rectangular orifices complete with tide gates to prevent back flow from temporarily flooded outlet ditches.

Recommendation

The plans, specifications and allied data relative to this project have been examined and substantial compliance with the Rules and Regulations of the Department has been noted.

It is recommended that a permit be issued for construction and operation subject to conditions common to all projects.

Respectfully submitted,

Mortimer M. Gibbons
Principal Public Health Engineer

6213:M

Decabromodiphenyl ether

m Wikipedia, the free encyclopedia

Decabromodiphenyl ether (decaBDE, deca-BDE, DBDE, deca, decabromodiphenyl oxide, DBDPO, bis(pentabromophenyl) ether) is a brominated flame retardant which belongs to the group of polybrominated diphenyl ethers (PBDEs).

Contents

- 1 Composition, uses, and production
- 2 Environmental chemistry
  - 2.1 The question of debromination
- 3 Pharmacokinetics
  - 3.1 Detection in humans
- 4 Possible health effects in humans
  - 4.1 Liver
  - 4.2 Thyroid
  - 4.3 Reproductive/developmental effects
  - 4.4 Neurological effects
- 5 Overall risks and benefits
- 6 Voluntary and governmental actions
  - 6.1 Europe
  - 6.2 United States
- 7 Alternatives
- 8 References

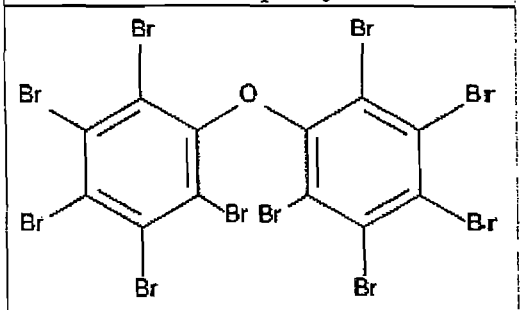
Composition, uses, and production

Commercial decaBDE is a technical mixture of different PBDE congeners, with PBDE congener number 209 (decabromodiphenyl ether) and nonabromodiphenyl ether being the most common.[1] The term **decaBDE** alone refers to only decabromodiphenyl ether, the single "fully brominated" PBDE.[2]

DecaBDE is a flame retardant. The chemical "is always used in conjunction with antimony trioxide" in polymers, mainly in "high impact polystyrene (HIPS) which is used in the television industry for cabinet backs."[1] DecaBDE is also used for "polypropylene drapery and upholstery fabric" by means of backcoating and "may also be used in some synthetic carpets."[1]

The annual demand worldwide was estimated as 56,100 tonnes in 2001, of which the Americas accounted for 24,500 tonnes, Asia 23,000 tonnes, and Europe 7,600 tonnes.[3] As of 2007, Albemarle in the U.S., Chemtura in the U.S., Dead Sea Bromine in Israel, and Tosoh Corporation in Japan manufacture decaBDE.[4][5]

Environmental chemistry

Decabromodiphenyl ether	
	
IUPAC name	2,3,4,5,6-Pentabromo-1-(2,3,4,5,6-pentabromophenoxy) benzene
Other names	DecaBDE, Deca-BDE, BDE-209
Identifiers	
CAS number	1163-19-5
SMILES	BrC1=C(OC2=C(Br)C(Br)=C(Br)C(Br)=C2Br)C(Br)=C(Br)C(Br)=C1Br
Properties	
Molecular formula	$C_{12}Br_{10}O$
Molar mass	959.17 g/mol
Appearance	White or pale yellow solid
Density	3.2 g/cm©¯ solid
Melting point	302.5 °C
Boiling point	425 °C
Solubility in water	not soluble
Hazards	
R-phrases	R40
S-phrases	S36/37
Related Compounds	
Related polybrominated diphenyl ethers	pentabromodiphenyl ether, octabromodiphenyl ether
Related compounds	Diphenyl ether
Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)	

Infobox disclaimer and references

As stated in a 2006 review, "Deca-BDE has long been characterized as an environmentally stable and inert product that was not capable of degradation he environment, not toxic, and therefore of no concern."[6] However, "some scientists had not particularly believed that Deca-BDE was so benign, particularly as evidence to this effect came largely from the industry itself."[6] One problem in studying the chemical was that "the detection of Deca-BDE in environmental samples is difficult and problematic"; only in the late 1990s did "analytical advances... allow[] detection at much lower concentrations."[6]

DecaBDE is released by different processes into the environment, such as emissions from manufacture of decaBDE-containing products and from the products themselves.[2] Elevated concentrations can be found in air, water, soil, food, sediment, sludge, and dust.[7] A 2006 study concluded "in general, environmental concentrations of BDE-209 [i.e., decaBDE] appear to be increasing."[7]

The question of debromination

An important scientific issue is whether decaBDE debrominates in the environment to PBDE congeners with fewer bromine atoms, since such PBDE congeners may be more toxic than decaBDE itself.[2] Debromination may be "biotic" (caused by biological means) or "abiotic" (caused by nonbiological means).[4] As of 2001, the Bromine Science and Environmental Forum (BSEF), which represents the chemical industry, stated "Studies commissioned by the bromine industry in order to assess the capacity of octa-BDE and deca-BDE to debrominate, i.e. degrade down to form penta-BDE and tetra-BDE, have proven that there is no debromination of BFRs [Brominated Flame Retardants] to these compounds."[8] The European Union (EU) in May 2004 stated "the formation of PBT/vPvB [Persistent, Bioaccumulative, and Toxic / very Persistent, very Bioaccumulative] substances in the environment as a result of degradation [of decaBDE] is a possibility that cannot be quantified based on current knowledge."[9] In September 2004 an Agency for Toxic Substances and Disease Registry (ATSDR) report asserted that "DecaBDE seems to be largely ,istant to environmental degradation."[2]

In May 2006, the EPHA Environment Network (now The Health and Environment Alliance) released a report reviewing the available scientific literature[10] and concluding the following:

- "It is difficult to assess the degree of BDE 209 photolytic debromination in house dust, soils and sediments when exposed to light. However, in cars debromination can be expected to occur more significantly."
- "In sewage anaerobic bacteria can initiate debromination of BDE 209, albeit at a slower rate than photolytic debromination, but due to the large volumes of DecaBDE in sewage sludge this may be significant."
- "Some fish appear capable of debrominating BDE 209 through metabolism. The extent of the metabolism varies among fish and it is difficult to determine the extent of debromination that would occur in the wild."

In response, the BSEF claimed in May 2006 that "the Deca-BDE present in the environment is not readily available for photolysis and therefore does not contribute significantly to environmental levels of lower BDEs."[11] In addition, the BSEF reiterated the findings of the May 2004 EU report.[9]

Subsequently, many studies have been published concerning decaBDE debromination. Common anaerobic soil bacteria debrominated decaBDE and octaBDE in a 2006 study.[12] In 2006-2007 studies, metabolic debromination of decaBDE was demonstrated in fish[13], birds[14], cows[15], and rats[16]. A 2007 study by La Guardia and colleagues measured PBDE congeners "from a wastewater treatment plant (sludge) to receiving stream sediments and associated aquatic biota"; it "support[ed] the hypothesis that metabolic debromination of -209 [i.e., decaBDE] does occur in the aquatic environment under realistic conditions."[17] In another 2007 study, Stapleton and Dodder exposed "both a natural and a DE 209 spiked [house] dust material" to sunlight, and found "nonabrominated congeners" and "octabrominated congeners" consistent with debromination of decaBDE in the environment.[18]

In March 2007 the Illinois Environmental Protection Agency concluded "it can be questioned how much abiotic and

microbial degradation [of decaBDE] occurs under normal environmental conditions, and it is not clear whether the more toxic lower-brominated PBDEs are produced in significant quantities by any of these pathways."[19] In September 2007 a U.K. Advisory Committee on Hazardous Substances issued an opinion that "The relevance of this ential degradation [photodegradation, biodegradation, and metabolism of decaBDE] to the real world is questionable. ... it is impossible to say what the level of concern is unless we have reliable figures for the degradation in the field."[20]

Pharmacokinetics

Exposure to decaBDE is thought to occur by means of ingestion.[2] Humans and animals do not absorb decaBDE well; at most, perhaps 2% of an oral dose is absorbed.[21][22] It is believed that "the small amount of decaBDE that is absorbed can be metabolized"[2].

Once in the body, decaBDE "might leave unchanged or as metabolites, mainly in the feces and in very small amounts in the urine, within a few days," in contrast with "lower brominated PBDEs... [which] might stay in your body for many years, stored mainly in body fat."[2] In workers with occupational exposure to PBDEs, the calculated apparent half-life for decaBDE was 15 days, as opposed to (for example) an octaBDE congener with a half-life of 91 days.[23]

Detection in humans

In the general population, decaBDE has been found in blood and breast milk, but at lower levels than other PBDE congeners such as 47, 99, and 153.[24] An investigation carried out by the WWF detected decaBDE in blood samples from 3 of 14 ministers of health and environment of European Union countries, while (for example) PBDE-153 was found in all 14.[25]

Possible health effects in humans

In 2004, ATSDR wrote "Nothing definite is known about the health effects of PBDEs in people. Practically all of the available information is from studies of laboratory animals. Animal studies indicate that commercial decaBDE mixtures are generally much less toxic than the products containing lower brominated PBDEs. Because of its very different toxicity, decaBDE is expected to have relatively little effect on the health of humans."[2] Based on animal studies, the possible health effects of decaBDE in humans involve the liver, thyroid, reproductive/developmental effects, and neurological effects.[26]

Liver

ATSDR stated in 2004 "We don't know if PBDEs can cause cancer in people, although liver tumors developed in rats and mice that ate extremely large amounts of decaBDE throughout their lifetime. On the basis of evidence for cancer in animals, decaBDE is classified as a possible human carcinogen by EPA [i.e., the United States Environmental Protection Agency]."[2]

Thyroid

One 2006 review concluded "Decreases in thyroid hormone levels have been reported in several studies, and thyroid gland enlargement (an early sign of hypothyroidism) has been shown in studies of longer duration exposure."[26] A 07 experiment giving decaBDE to pregnant mice found that decaBDE "is likely an endocrine disrupter in male mice ollowing exposure during development" based on results such as decreased serum triiodothyronine.[27]

Reproductive/developmental effects

"Significant data gaps" exist in the scientific literature on a possible relationship between decaBDE and reproductive/developmental effects.[26] A 2006 study of mice found that decaBDE decreased some "sperm ctions."[28]

Neurological effects

A single study in 2003 on neurotoxicity in mice was "criticized for certain procedural and statistical problems."[26] A 2007 study in mice "suggest[ed] that decaBDE is a developmental neurotoxicant that can produce long-term behavioral changes following a discrete period of neonatal exposure."[29] Administration of decaBDE to male rats at 3 days of age in another 2007 study "was shown to disrupt normal spontaneous behaviour at 2 months of age."[30]

Overall risks and benefits

In 2002-2003 the American Chemistry Council's Brominated Flame Retardant Industry Panel, citing an unpublished 1997 study, estimated that 280 deaths due to fires are prevented each year in the U.S. because of the use of decaBDE.[21][22] The American Council on Science and Health, in a 2006 report largely concerning decaBDE, concluded that "the benefits of PBDE flame retardants, in terms of lives saved and injuries prevented, far outweigh any demonstrated or likely negative health effects from their use."[31] A 2006 study concluded "current levels of Deca in the United States are unlikely to represent an adverse health risk for children."[32] A report from the Swedish National Testing and Research Institute concerning the costs and benefits of decaBDE in television sets that was funded by BSEF assumed "no cost for injuries (either to humans or the environment) due to exposure to flame retardants... as there was no indication that such costs exist for DecaBDE"; it found that decaBDE's benefits exceeded its costs.[33]

oluntary and governmental actions

Europe

In Germany, plastics manufacturers and the textile additives industry "declared in 1986 a voluntary phase-out of the use of PBDEs, including Deca-BDE."[34] Although decaBDE was to be phased out of electrical and electronic equipment in the EU by 2006 under the EU's Restriction of Hazardous Substances Directive (RoHS), decaBDE use has been exempted from RoHS beginning in 2005 and continuing for five years.[35][36] A case in the European Court of Justice against the RoHS exemption is pending.[4] Sweden, an EU member, banned decaBDE as of 2007.[24][37] The European Brominated Flame Retardant Industry Panel (EBFRIP), which represents the chemical industry, stated that Sweden's ban on decaBDE "is a serious breach of EU law."[38] The environment agency of Norway, which is a member of the European Free Trade Association but is not a member of the EU, recommended that decaBDE be banned from electronic products; however, the Norwegian coalition government rejected the recommendation.[39]

United States

A representative of the BSEF stated in 2007 "There's no reason to ban deca ... it's not a scientifically supportable position."[37] Nevertheless, as of mid-2007 two states had instituted measures to phase out decaBDE. In April 2007 the state of Washington passed a law banning the manufacture, sale, and use of decaBDE in mattresses as of 2008; the ban "could be extended to TVs, computers and upholstered residential furniture in 2011 provided an alternative flame retardant is approved."[5][40][41] In June 2007 the state of Maine passed a law "ban[ning] the use of deca-BDE in ıttresses and furniture on January 1, 2008 and phas[ing] out its use in televisions and other plastic-cased electronics oy January 1, 2010."[42][43] As of 2007, other states considering restrictions on decaBDE include California, Connecticut, Hawaii, Illinois, Massachusetts, Michigan, Minnesota, Montana, and New York.[37][44]

Alternatives

A number of reports have examined alternatives to decaBDE as a flame retardant.[34][45][46][47][48][49] The BSEF noted in 2007 that "any substance used as an alternative to Deca will carry its own risks, and we may not even be aware just what those risks are because no alternative has been studied as extensively as Deca."[50] At least three U.S. states have evaluated decaBDE alternatives:

- Washington concluded in 2006 that "there do not appear to be any obvious alternatives to Deca-BDE that are less toxic, persistent and bioaccumulative and have enough data available for making a robust assessment" and that "there is much more data available on Deca-BDE than for any of the alternatives."[51]
- Maine in January 2007 stated that bisphenol A diphenyl phosphate (also known as BDP, BPADP, bisphenol A diphosphate, or BAPP) "is not a suitable alternative to decaBDE" because "one of the degradation products is bisphenol A, a potent endocrine disruptor."[4] The report listed resorcinol bis(diphenyl phosphate) (also known as RDP), magnesium hydroxide, and other chemicals as alternatives to decaBDE that are "most likely to be used."[4]
- A March 2007 report from Illinois categorized decaBDE alternatives as "Potentially Unproblematic," "Potentially Problematic," "Insufficient Data," and "Not Recommended."[19] The "Potentially Unproblematic" alternatives were BAPP, RDP, aluminum trihydroxide, and magnesium hydroxide.[19]

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Octabromodiphenyl ether

m Wikipedia, the free encyclopedia

Octabromodiphenyl ether (octaBDE, octa-BDE, OBDE, octa, octabromodiphenyl oxide, OBDPO) is a brominated flame retardant which belongs to the group of polybrominated diphenyl ethers (PBDEs).

Composition, uses, and production

Exposures and health effects

octaBDE may enter the body by ingestion or inhalation.[3] It is "stored mainly in body fat" and may stay in the body for years.[3] In an investigation carried out by the WWF, "the brominated flame retardant chemical (PBDE 153), which is a component of the penta- and octa- brominated diphenyl ether flame retardant products" was found in all blood samples of 14 ministers of health and environment of 13 European Union countries.[8]

The chemical has no proven health effects in humans; however, based on animal experiments, octaBDE may have effects on "the liver, thyroid, and neurobehavioral development."[3]

Governmental actions

The European Union has carried out a comprehensive risk assessment under the Existing Substances Regulation 793/93/EEC.[4] As a consequence, the EU has banned the use of octaBDE since 2004.[9]

In the United States, as of 2005, "no new manufacture or import of" pentaBDE and octaBDE "can occur... without first being subject to EPA [i.e., United States Environmental Protection Agency] evaluation."[10] As of mid-2007, a total of eleven states in the U.S. had banned octaBDE.[11]

It has been proposed that octaBDE be added to the Stockholm Convention as it meets the criteria for the so-called persistent organic pollutants of persistence, bioaccumulation and toxicity.[2]

Alternatives

Alternatives to octaBDE include tetrabromobisphenol A, 1,2-bis (pentabromophenoxy) ethane, 1,2-bis (tribromophenoxy)ethane, triphenyl phosphate, resorcinol bis(diphenylphosphate), and brominated polystyrene; however, for each of these "the existing data on toxicological and ecotoxicological effects are fewer than for octabromodiphenyl ether."[12]

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Pentabromodiphenyl ether

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Pentabromodiphenyl ether (pentaBDE, penta-BDE, PeBDE, penta, pentabromodiphenyl oxide, PBDPO) is a brominated flame retardant which belongs to the group of polybrominated diphenyl ethers (PBDEs).

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- 2 Environmental chemistry
- 3 Exposures and health effects
- 4 Voluntary and governmental actions
- 5 Alternatives
- 6 References

Composition, uses, and production

Commercial pentaBDE is a technical mixture of different PBDE congeners, with BDE-47 (2,2',4,4'- tetrabromodiphenyl ether) and BDE-99 (2,2',4,4',5-pentabromodiphenyl ether, pictured in the Infobox) as the most abundant.[1] The term **pentaBDE** alone refers to isomers of pentabromodiphenyl ether ›DE congener numbers 82-127).[2]

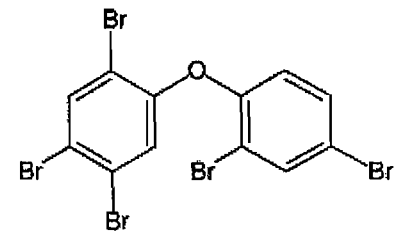
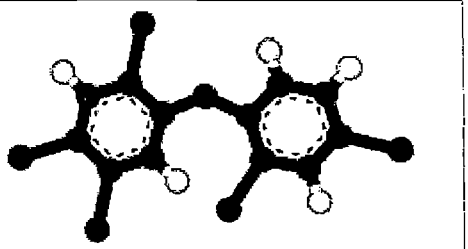
Commercial pentaBDE is most commonly used as a flame retardant in flexible polyurethane foam; it was also used in printed circuit boards in Asia, and in other applications.[1] The annual demand worldwide was estimated as 7,500 tonnes in 2001, of which the Americas accounted for 7,100 tonnes, Europe 150 tonnes, and Asia 150 tonnes.[3] As of 2007, "there should be no current production of C-PentaBDE [commercial pentaBDE] in Europe, Japan, Canada, Australia and the US"; however, it is possible that production continues elsewhere in the world.[1]

Environmental chemistry

PentaBDE is released by different processes into the environment, such as emissions from manufacture of pentaBDE-containing products and from the products themselves.[1] Elevated concentrations can be found in air, water, soil, food, sediment, sludge, and dust.[1][4][5]

Exposures and health effects

PentaBDE may enter the body by ingestion or inhalation.[2] It is "stored ainly in body fat" and may stay in the body for years.[2] A 2007 study found that PBDE 47 (a tetraBDE) and PBDE 99 (a pentaBDE) had biomagnification factors in terrestrial carnivores and humans of 98, higher than any other industrial chemicals studied.[6] In an investigation carried out by the WWF,

Pentabromodiphenyl ether	
	
	
IUPAC name	1,2,4-tribromo-5-(2,4-dibromophenoxy) benzene
Other names	PentaBDE, Penta-BDE, PeBDE
Identifiers	
CAS number	32534-81-9
PubChem	36159
Properties	
Molecular formula	$C_{12}H_5Br_5O$
Molar mass	564.69 g/mol
Appearance	amber solid
Solubility in water	not soluble
Hazards	
R-phrases	R48/21/22, R50/53, R64
S-phrases	(S1/2), S36/37, S45, S60, S61
Related Compounds	
Related polybrominated diphenyl ethers	octabromodiphenyl ether, decabromodiphenyl ether
Related compounds	diphenylether

Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)
Infobox disclaimer and references

"the brominated flame retardant chemical (PBDE 153), which is a component of the penta- and octa- brominated diphenyl ether flame retardant products" was found in all blood samples of 14 ministers of health and environment of 13 European Union countries.[7]

The chemical has no proven health effects in humans; however, based on animal experiments, pentaBDE may have effects on "the liver, thyroid, and neurobehavioral development."[2]

Voluntary and governmental actions

In Germany, industrial users of pentaBDE "agreed to a voluntary phaseout in 1986."[8] In Sweden, the government "phase[d] out the production and use of the [pentaBDE] compounds by 1999 and a total ban on imports came into effect within just a few years."[8] The European Union (EU) has carried out a comprehensive risk assessment under the Existing Substances Regulation 793/93/EEC[9]; as a consequence, the EU has banned the use of pentaBDE since 2004.[10]

In the United States, as of 2005, "no new manufacture or import of" pentaBDE and octaBDE "can occur... without first being subject to EPA [i.e., United States Environmental Protection Agency] evaluation."[11] As of mid-2007, a total of eleven states in the U.S. had banned pentaBDE.[12]

It has been proposed that pentaBDE be added to the Stockholm Convention as it meets the criteria for the so-called persistent organic pollutants of persistence, bioaccumulation and toxicity.[1]

Alternatives

The EPA organized a Furniture Flame Retardancy Partnership beginning in 2003 "to better understand fire safety options for the furniture industry" after pentaBDE "was voluntarily phased out of production by the sole U.S. manufacturer on December 31, 2004."[13] In 2005 the Partnership published evaluations of alternatives to pentaBDE, including triphenyl phosphate, tribromoneopentyl alcohol, tris(1,3-dicholoro-2-propyl)phosphate, and 12 proprietary chemicals.[14]

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Investigation into levels of dioxins, furans, polychlorinated biphenyls and brominated flame retardants in fishery produce in Ireland.

January 2007

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1. Summary

The Food Safety Authority of Ireland in collaboration with the Marine Institute and An Board Iascaigh Mhara (Sea Fisheries Board) has carried out a surveillance study of levels of dioxins (PCDDs), furans (PCDFs) polychlorinated biphenyls (PCBs), and brominated flame retardants (BFRs), specifically polybrominated diphenylethers (PBDEs) and hexabromocyclododecane (HBCD), in a variety of fish species and fishery products, including fresh and processed products available on the Irish market. The study was undertaken because of concern about the possible effects on human health of these bio-persistent environmental contaminants, known to be present in a number of foodstuffs, notably meat, fish, eggs and dairy products.

The study showed that levels of PCDDs and PCDFs in Irish fish and fishery products available on the Irish market were well below existing EC legal limits for these contaminants as laid down in Regulation 466/2001. The lowest level was found in a sample of canned tuna (0.012 ng WHO TEQ/kg whole weight) with the highest level found in a farmed salmon sample (0.82 ng WHO TEQ/kg whole weight), compared with the maximum level under the legislation of 4 ng WHO TEQ/kg whole weight.

The levels found were also below the new limits for dioxin-like PCBs (dl-PCBs) and for the sum of WHO-TEQs for PCDDs, PCDFs and dioxin-like PCBs, which were introduced in November, 2006 via Regulation 199/2006. The upper-bound mean levels of PCDDs, PCDFs and dioxin-like PCBs expressed as total WHO-TEQs ranged from 0.05 – 2.15 ng/kg WHO TEQ whole weight, which can be compared with the new maximum level of 8 ng WHO TEQ/kg whole weight for the sum of PCDDs, PCDFs and dioxin-like PCBs.

Results of this study are in line with those from previous FSAI studies on PCDD and PCDF levels in fish and also in meat, milk and eggs, and indicate relatively low levels of these contaminants in fishery produce available in the Irish marketplace. Reductions of PCDD/Fs and dl-PCBs in Irish farmed salmon were observed in comparison to levels measured in a previous FSAI/MI survey in 2001, in which a mean level of 4.02 ng WHO TEQ/kg whole weight was detected compared with 2.15 ng/kg WHO TEQ whole weight in the present study. Similar observations can be made for levels reported in a study carried out by An Board Iascaigh Mhara in 2004, in which a mean level of 1.75 ng WHO TEQ/kg whole weight was reported.

Concentrations of brominated flame retardants were also low. The mean PBDE concentrations ranged from <0.31 to 3.71 µg/kg whole weight in canned tuna to farmed salmon respectively. Although there are no acceptable daily intake (ADI) or maximum limits set for PBDEs or HBCD, the levels of these contaminants found in the study were low, and are very unlikely to present a health risk to Irish consumers.

Although fish is a recognised dietary source of PCDDs, PCDFs and PCBs, the health benefits of eating fish are well established, and on the basis of these results the FSAI considers that there is no need to alter current advice on fish consumption. Current advice is that consumers should eat two portions of fish a week, one of which should be oily. The full study report follows, providing further sampling details, analytical methodologies and discussion of the resulting datasets.

2. Background

The Food Safety Authority of Ireland (FSAI) has a statutory responsibility to ensure the safety of food consumed, distributed, produced and sold on the Irish market. In this respect, the FSAI co-ordinates the collation of food safety surveillance information from laboratories run by its official agents, the Health Service Executive (HSE), the Department of Agriculture and Food, the Department of Communication, Marine and Natural Resources, the Marine Institute and the local authorities. The FSAI also conducts targeted food safety surveillance in areas where potential safety issues have been identified and/or on food contaminants for which there are currently no testing facilities in Ireland, such as dioxins.

The nutritional benefits of eating fish, in particular oily fish, are well known. The FSAI advises consumers to eat two portions of fish each week, of which one should be oily. In recent years there has been some public debate concerning the health risks to consumers associated with persistent organic pollutants, such as dioxins, in certain species of fish.

This report provides the results of a targeted surveillance study undertaken in 2004 - 2005 in collaboration with the Marine Institute and An Board Iascaigh Mhara (Sea Fisheries Board) on levels of dioxins (PCDDs), furans (PCDFs), polychlorinated biphenyls (PCBs), and brominated flame retardants (BFRs), specifically polybrominated diphenyl ethers (PBDEs) and hexabromocyclododecane (HBCD) isomers in a variety of fishery products available on the Irish market.

The present work builds on previous studies undertaken by FSAI into levels of these environmental contaminants in fish and fish oils (FSAI, 2002a, undertaken jointly with the Marine Institute), meat (FSAI, 2004a), milk (FSAI, 2002b) and eggs (FSAI, 2004b), and was undertaken against the background of increased awareness in the European Union of the possible health risks posed by these substances in the food chain. It also reflects Ireland's participation in the 2004 – 2006 EC monitoring programme for the background presence of dioxins, furans and dioxin-like PCBs in foodstuffs which has been agreed between the European Commission and the Member States via Commission Recommendation 2004/705/EC. The EC monitoring programme has recently been extended for a further 2 years, until 31st December 2008, via Commission Recommendation 2006/794/EC (repealing Recommendation 2004/705).

Monitoring of other residues and environmental contaminants, such as trace metals in fish and shellfish is undertaken by the Marine Institute as part of a service contract with FSAI (e.g. Marine Institute 2004a, 2004b). An Board Iascaigh Mhara have also recently carried out studies into levels of PCDDs, PCDFs and PCBs in Irish farmed salmon (Gruemping *et al.*, 2004).

As part of this study, analysis of nutritionally beneficial polyunsaturated fatty acids (PUFAs) was also undertaken. These results will be the subject of a separate report.

2.1 Dioxins and furans (PCDDs and PCDFs)

The term 'dioxins' covers a group of 75 polychlorinated dibenzo-p-dioxin (PCDD) and 135 polychlorinated dibenzofuran (PCDF) congeners, 17 of which are of toxicological concern. Exposure to dioxins can result in a wide range of toxic responses, including dermal toxicity (chloracne), immunotoxicity, carcinogenicity, reproductive toxicity and possible neurobehavioral (cognitive) effects (SCF, 2000). Studies on children exposed *in utero* to dioxins are reported to have shown persistent endocrine and developmental changes (SCF, 2000). The toxicological effects of dioxins are thought to arise due to binding to a specific receptor protein within cells, the aryl hydrocarbon (Ah) receptor, present in most tissues of animals and humans. The most toxic dioxin congener is 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (TCDD) and is classified by the International Agency for Research on Cancer (IARC) and other international organisations as a known human carcinogen. By analogy other dioxins are therefore considered as presumed carcinogens. The EU Scientific Committee for Food (SCF), in line with the World Health Organisation (WHO), have concluded however that the carcinogenic effect of dioxins does not occur at levels below a certain threshold (SCF, 2000).

Dioxins are chlorinated environmental contaminants and have no known commercial applications, other than in the preparation of analytical standards and research materials. They are formed during combustion processes, for example in the incineration of municipal waste, although natural combustion processes such as forest fires and bonfires may also result in dioxin formation. They can also occur as by-products of industrial processes, for example production and use of pentachlorophenol-containing wood preservatives, production and use of certain herbicides and bleaching of paper pulp using chlorine. Dioxins have been identified in almost all environmental compartments as a result of these emissions. Emissions of dioxins to air may ultimately result in deposition in the terrestrial environment and in aquatic sediments, followed by uptake into the food chain e.g. by ruminants and fish.

Dioxins are highly resistant to degradation processes in the environment and consequently persist in the environmental compartments where they have been deposited. This in part is due to their lipophilic characteristics, which can result in accumulation in the fatty tissues of the primary intake species e.g. cattle or fish. Approximately 90% of human exposure to dioxins and furans results from the consumption of contaminated food. Exposure by other routes, such as inhalation and ingestion of particles from air, ingestion of contaminated soil and dermal absorption normally contributes less than 10% of daily intake.

Humans are considered the ultimate consumers in the food chain, and accumulate dioxins in body tissues primarily as a result of exposure via food. In the case of cows or other lactating species, high levels of dioxins can potentially occur in milk (specifically in milk fat) and consequentially also in cream and in milk products such as cheese, in addition to accumulation within carcass meat. In fish, levels are usually higher in fatty tissues such as the liver and consequently levels can be more elevated in fish liver oils. In Europe, the fraction of the dietary intake of dioxins contributed by these foods is: fish and fish products (2 – 63%),

meat and meat products (6 – 32%); milk and dairy products (16 – 39%). Fruit and vegetables provide only a minor contribution to human intake (European Commission, 2000).

The Belgium dioxin crisis in 1999 triggered an increased awareness in the European Union of the dangers posed by dioxins, furans and polychlorinated biphenyls in the food chain and as a consequence of this crisis, the European Community (EC) established maximum levels for dioxins in furans in foodstuffs, in order to protect the health of consumers.

2.2 Polychlorinated Biphenyls (PCBs)

Polychlorinated biphenyls or PCBs are a group of extremely stable aromatic chlorinated compounds which, like dioxins, are relatively resistant to biological degradation and hence persist and accumulate in the environment and in the food chain. There are 209 structurally possible PCB compounds (congeners), with one to ten chlorine atoms per molecule. They have excellent electrical and heat transfer properties, which led to their widespread use in a variety of industrial, commercial and domestic applications. The production and use of PCBs has been discontinued in most countries, due to concern about their toxicity and persistence, but large amounts remain in electrical equipment, plastic products, buildings and the environment. Incorrect disposal of such material can result in continued release to the environment, adding to existing levels present as a consequence of past releases.

PCBs are generally regarded as having potential to cause adverse effects on health, with particular concern being expressed about the 12 so-called dioxin-like PCBs. This group of non-ortho (PCBs 77, 81, 126, 169) and mono-ortho (PCBs 105, 114, 118, 123, 156, 157, 167, 189) PCBs are assumed to have essentially the same toxicity potential as the dioxins and furans, since they also bind to the Ah receptor.

Other PCBs (non-dioxin-like PCBs) do not exert their toxicological effects via binding to the Ah receptor but nonetheless are associated with a wide spectrum of toxic responses, including developmental effects, immuno- and neurotoxicity, endocrine disrupting effects and tumour promotion. The so-called marker or indicator PCBs have been used as indicators of the total PCB content or body burden of environmental biota, food and human tissue. The most frequent approach is to use either the total level of six of the most commonly occurring PCBs (6 indicator PCBs, PCBs 28, 52, 101, 138, 153 and 180) or the total level of seven of these (7 indicator PCBs, PCBs 28, 52, 101, 118, 138, 153 and 180), including the dioxin-like PCB 118.

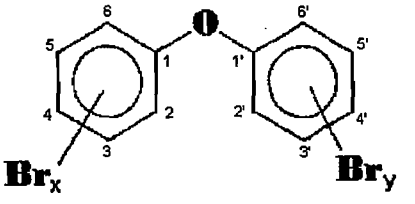
2.3 Polybrominated Diphenyl Ethers (PBDEs)

Brominated flame retardants (BFRs) are a group of chemicals which are added to many household products for the purpose of fire prevention. The types of products containing these chemicals include clothing and household textiles, furniture, computers and TVs.

There are five major classes of brominated flame retardants: brominated bisphenols, brominated diphenyl ethers, brominated cyclododecanes, brominated phenols and brominated phthalic acid derivatives. This survey covers polybrominated diphenyl ethers (PBDEs) only.

The term polybrominated diphenyl ethers (PBDEs) refers to three commercial mixtures of decabromodiphenyl ether (DBDE), octabromodiphenyl ether (Octa, OBDE), and pentabromodiphenyl ether (Penta, pentaBDE). The European Union banned production of both pentaBDE and octaBDE in 2004, however decaBDE (DBDE) is still in use.

The general chemical formula of PBDEs is



(Source: WHO, 1994, BROMINATED DIPHENYL ETHERS, ENVIRONMENTAL HEALTH CRITERIA 162, Geneva)

PBDEs are similar in structure to PCBs (polychlorinated biphenyls) and also have some similarities to the dioxin family of chemicals. They contain the element bromine rather than the chlorine found in the PCBs. Like the dioxins and PCBs, the PBDEs break down slowly in the environment and in living organisms including the human body. Continuous exposure can result in accumulation of PBDEs in body tissues. Because they show physico-chemical similarities to dioxins and PCBs, they may have some of the health effects of these chemicals, although they appear to be less toxic. Recent toxicological studies have shown that some PBDEs have endocrine or hormone disrupting properties, an effect that is also associated with dioxins and PCBs, and is thought to be associated with changes in fertility, sexual development and possibly certain types of cancer such as breast, testicular and prostate cancer. It has also been reported that PBDEs can have an effect on brain development in mice, slowing the learning process. As with PCBs, exposure to PBDEs may be particularly harmful during a critical window of brain development during pregnancy and early childhood. While the pentabromo compounds appear to be the most toxic, many of these persistent chemicals have not been extensively studied.

PBDEs were first reported in wildlife species, including fish, seals, whales and birds' eggs. In the late 1990's they were reported in the breast milk of mothers in Sweden, and research showed that levels had increased from zero in 1970 to high levels in the 1990's in parallel with the use of PBDEs. Following restrictions on their use in Sweden, followed by the EC-wide ban on Penta and Octa-mixtures, levels in breast milk in European women are now dropping, but in contrast levels in human tissues and breast milk in North America are still rising.

A recent study carried out by Hites and co-workers (Hites *et al*, 2004) has reported PBDEs to be present in both farmed and wild salmon. Although the levels of the contaminants were generally higher in farmed fish than wild fish, one species of wild salmon contained the highest level of PBDE found in the study.

There is only very limited information on the presence of PBDEs in other foods. The EC is currently considering the establishment of maximum limits for these chemicals in food and is encouraging Member States to carry out measurements to assist in this process.

2.4 Hexabromocyclododecane (HBCD)

Hexabromocyclododecane (HBCD) has primarily been used to improve flame retardant characteristics of extruded and expanded polystyrene products. Technical HBCD comprises three diasteroisomers (α, β and γ), with γ-HBCD contributing approximately 80% to the technical formulation. Although the evidence for the widespread environmental presence of HBCD is small, its detection in a wide range of matrices is a potential environmental and consumer food safety concern. Furthermore, its usage may increase as alternative BFRs (such as PentaBDE) are phased out.

2.5 Toxic equivalence factors for dioxins and dioxin-like PCBs

The toxicity of PCDDs, PCDFs and the dioxin-like PCB congeners are expressed using toxic equivalence factors (TEFs) (see Tables 1 and 2) representing the relative toxicity of the compound being measured to the most toxic dioxin congener, TCDD. This in turn reflects the relative strength of binding to the Ah receptor. It should be noted however that the toxicity of many of these substances, both dioxins and PCBs, has not been extensively evaluated.

An arbitrary TEF of 1 is assigned to TCDD, and by multiplying the analytically determined concentrations of each congener in a sample by its corresponding TEF, individual toxicity equivalents (TEQs) are determined. Summing the contribution from each congener, the total TEQ value of the sample can be obtained using the following equation:

$$TEQ = (PCDDi \times TEFi) + (PCDFi \times TEFi) + (\textit{dioxin-like}\ PCBi \times TEFi)$$

Several different TEF schemes have been proposed. For many years the most widely used schemes were that of NATO/CCMS (NATO/CCMS, 1988), giving the so-called International TEFs (I-TEFs) for PCDDs and PCDFs and the WHO-ECEH (European Centre for Environment and Health of the World Health Organization) scheme for PCBs. In 1998, WHO-ECEH proposed a new scheme of WHO-TEFs for PCDDs, PCDFs and dl-PCBs, which to date has been the most commonly used scheme (van den Berg *et al*, 1998). Dioxin TEQ values for food and human samples based on WHO-TEFs are approximately 10-20% higher than those obtained by using the I-TEFs of NATO/CCMS. WHO has recently re-evaluated the WHO-TEFs

proposed in 1998 (van den Berg *et al*, 2006) and has adjusted the TEFs for a number of compounds. The results provided in this report are however based on the 1998 scheme for WHO-TEFs.

Table 1 Toxic Equivalence Factors (TEFs) for Dioxins and Dioxin-like PCBs

PCDDs and PCDFs	I-TEF (NATO/CCMS, 1988)	WHO-TEF (van den Berg *et al*, 1998)
2,3,7,8-TCDD	1	1
1,2,3,7,8-PnCDD	0.5	1
1,2,3,4,7,8-HxCDD	0.1	0.1
1,2,3,6,7,8-HxCDD	0.1	0.1
1,2,3,7,8,9-HxCDD	0.1	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.01
OCDD	0.001	0.0001
2,3,7,8-TCDF	0.1	0.1
1,2,3,7,8-PnCDF	0.05	0.05
2,3,4,7,8-PnCDF	0.5	0.5
1,2,3,4,7,8-HxCDF	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01
OCDF	0.001	0.0001
PCBs (IUPAC No. in parenthesis)	**I-TEF (NATO/CCMS, 1988)**	**WHO-TEF (van den Berg *et al*, 1998)**
Non-ortho PCBs		
3,3',4,4'-TCB (77)	0.0005	0.0001
3,4,4',5-TCB (81)	-	0.0001
3,3',4,4',5-PnCB (126)	0.1	0.1
3,3',4,4',5,5'-HxCB (169)	0.01	0.01
Mono-ortho PCBs		
2,3,3',4,4'-PnCB (105)	0.0001	0.0001
2,3,4,4',5-PnCB (114)	0.0005	0.0005
2,3',4,4',5-PnCB (118)	0.0001	0.0001
2,3,4,4'5-PnCB (123)	0.0001	0.0001
2,3,3',4,4',5-HxCB (156)	0.0005	0.0005
2,3,3',4,4',5'-HxCB (157)	0.0005	0.0005
2,3',4,4',5,5'-HxCB (167)	0.00001	0.00001
2,3,3',4,4',5,5'-HpCB (189)	0.0001	0.0001
Di-ortho PCBs		
2,2',3,3',4,4',5-HpCB (170)	0.0001	0.0001
2,2',3,4,4',5,5'-HpCB (180)	0.00001	0.00001

PnCDD, pentachlorodibenzo-p-dioxin; HxCDD, hexachlorodibenzo-p-dioxin; HpCDD, heptachlorodibenzo-p-dioxin; OCDD, octachlorodibenzo-p-dioxin; PnCDF, pentachlorodibenzofuran; HxCDF, hexachlorodibenzofuran; HpCDF, heptachlorodibenzofuran; OCDF, octachlorodibenzofuran. TCB, tetrachlorobiphenyl; PnCB, pentachlorobiphenyl; HxCB, hexachlorobiphenyl; HpCB, heptachlorobiphenyl.

2.6 Risk assessment of dioxins, furans and PCBs in food

The SCF have carried out a risk assessment of dioxins and dioxin-like PCBs in food (SCF, 2000, SCF, 2001), as a consequence of which they concluded that the Tolerable Weekly Intake (TWI) for PCDDs, PCDFs and dl-PCBs should be no more than 14 pg WHO-TEQ/kg body weight (b.w.). This is very similar to the Provisional Tolerable Monthly Intake (PTMI) of 70 pg/kg b.w. per month derived by the FAO/WHO Joint Expert Committee on Food Additives and Contaminants (JECFA) (JECFA, 2002). It has been stated that the European average dietary intake is 1.2 to 3.0 pg WHO-TEQ/kg b.w./day, which translates into a weekly intake of between 8.4 and 21 pg WHO-TEQ/kg b.w. The upper end of this range exceeds the TWI as established by the SCF.

However, several studies carried out by the Food Safety Authority of Ireland (FSAI) have indicated that levels of dioxins in Irish food are relatively low. The 2002 collaborative study between County Council Cork and FSAI on dioxins, furans and PCBs in milk (FSAI, 2002b) showed dioxin levels ranging from 0.28 to 0.42 pg WHO-PCDD/F-TEQ/g fat over the period 1995 to 2001, compared with a regulatory Maximum Limit (ML) of 3 pg WHO-TEQ/g fat (Table 2). A study conducted on meat (carcass fat) from cattle, sheep, pigs and poultry in 2004 showed levels ranging from 0.08 – 0.62 pg WHO-PCDD/F-TEQ/g fat, which are well below the established regulatory maximum limits for the various animal species (FSAI, 2004a).

Similarly, the FSAI/Marine Institute (MI) study on levels of dioxins and dioxin-like PCBs in farmed fish and fish oil supplements (FSAI, 2002a) showed levels of PCDD/Fs in wild salmon ranging from 0.14 to 0.62 ng WHO-TEQ/kg whole weight, in farmed salmon from 0.59 to 1.50 ng WHO-TEQ/kg and in farmed trout from 0.17 to 0.55 ng WHO-TEQ/kg, compared with a regulatory Maximum Limit (ML) of 4 ng WHO-TEQ/kg for fish muscle meat on a whole weight basis (Table 2). Levels of total TEQ (Sum PCDD/Fs and dl-PCBs) were determined as follows: wild salmon 0.68 to 1.8 ng WHO-TEQ/kg whole weight; farmed salmon 2.3 to 6.3 ng WHO-TEQ/kg whole weight; and farmed trout 0.7 to 2.0 ng WHO-TEQ/kg whole weight. This confirmed previous findings that the contribution of dl-PCBs to the total TEQ is greater than PCDD/Fs for these fish in European waters (European Commission 2000). In the 2004 study of An Board Iascaigh Mhara, a mean level of 0.41 ng WHO TEQ/kg whole weight was reported for PCDD/Fs in farmed Irish salmon (Gruemping *et al.*, 2004).

These studies indicate that levels of dioxins, furans and dioxin-like PCBs found in Irish milk, fish and meat are lower than those found in comparable foodstuffs from the more industrialised EC countries. Hence, it is likely that the exposure of the Irish population to dioxins in food is less than the European average.

A risk assessment for the non-dioxin-like PCBs (ndl-PCBs) in food has also been carried out recently at European level by the Scientific Panel on Contaminants of the European Food Safety Authority (EFSA), to include identification of the most relevant/sensitive toxicological endpoints for the PCB-congener patterns usually found in food (EFSA, 2005a). The panel concluded that the current toxicological database on health effects is not suitable for the separate assessment of ndl-PCBs. Also the human data on exposure did not

enable a distinction between the effects of ndl-PCB and PCDD/F to be made, due to co-occurrence of PCDDs and PCDFs, and therefore the assessment was based on individual ndl-PCB congeners. Due to the absence of mutagenicity the establishment of a health-based guidance value for levels of ndl-PCBs in food was considered possible, however, the panel considered the toxicological database too limited and hence a "Margin of Exposure" (MoE)[1] approach was used. This approach, which can be used to assess the risks to human health of exposure to a substance in absence of a tolerable daily intake or similar guidance value, has recently been endorsed by the EFSA Scientific Committee (EFSA, 2005b) and the WHO/FAO Joint Expert Committee on Food Additives and Contaminants (WHO/FAO, 2005). A rather small margin of exposure of 10 was calculated, however, the panel stressed that the endpoints considered in the evaluation of individual ndl-PCB congeners can also be observed with PCDD/F and dl-PCB. Overall, the panel concluded that further research and additional data is needed to better evaluate adverse effects from ndl-PCBs and a continuing effort to lower the levels of ndl-PCB in food is warranted.

2.7 Legislation on dioxins, furans and PCBs in food

Given that the weekly average dietary intake of dioxins by at least some of the European population exceeds the TWI established by the SCF, on a European scale it is desirable to reduce the exposure of the population to dioxins. In 2001, the European Commission published its Community strategy for dioxins, furans and polychlorinated biphenyls, aimed at achieving a reduction in human exposure to dioxins and PCBs (European Commission, 2001). Environmental legislation designed to limit dioxin emissions is in the process of discussion at European level. Other source-directed measures have been introduced to reduce the contamination of feeding stuffs for animal nutrition (Council Directive 2001/102/EC amending Directive 1999/29/EC on the undesirable substances and products in animal nutrition).

In addition, as part of its reduction strategy the E.C. has also introduced maximum levels for PCDDs, PCDFs and dioxin-like PCBs in foodstuffs, via Council Regulation (EC) No. 1881/2006[2] which sets maximum levels for certain contaminants in foodstuffs. Table 2 shows the maximum levels established in this Regulation for dioxins (sum of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), expressed in World Health Organisation (WHO) toxic equivalents using the WHO-TEFs (toxic equivalency factors (van den Berg *et al*, 1998), and sum of dioxins and dioxin-like PCBs, sum of polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and polychlorinated biphenyls (PCBs), expressed in World Health Organisation toxic equivalents using the WHO-TEFs.

[1]The margin of exposure is defined as the reference point on the dose-response curve (usually based on animal experiments in the absence of human data) divided by the estimated intake by humans. (EFSA 2005b).

[2]This Regulation consolidates all legislation on contaminants and replaces Commission Regulation 466/2001 and all its amendments. The new legislation applies from 1st March, 2007, and until this date the limits laid down in Commission Regulation 466/2001 (which are identical to those in the new Regulation) remain in force.

The legislation also imposes an obligation on Member States to monitor the levels of dioxins in foodstuffs and report results to the E.C. Under this obligation, Ireland is required to carry out monitoring for a range of contaminants in a variety of foodstuffs. Results for previous monitoring surveys have been published and reports are available on the FSAI website (FSAI, 2002a, 2002b, 2004a, 2004b). Such data will ultimately be used to review the maximum limits and gauge the effectiveness of the reduction strategy.

Table 2 Maximum Levels for dioxins, furans and dioxin-like PCBs in food

FOOD	Maximum levels Sum of dioxins and furans (WHO-PCDD/F-TEQ) [2]	Maximum levels Sum of dioxins, furans and dioxin-like PCBs (WHO-PCDD/F-PCB-TEQ) [1] [2]
5.1.1 Meat and meat products [3] - of ruminants (bovine animals, sheep) - of poultry and farmed game - of pigs 5.1.2 Liver and derived products of terrestrial animals	 3 pg/g fat[4] 2 pg/g fat [4] 1 pg/g fat [4] 6 pg/g fat [4]	 4.5 pg/g fat[4] 4 pg/g fat[4] 1.50 pg/g fat[4] 12 pg/g fat[4]
5.2 Muscle meat of fish and fishery products and products thereof with the exception of eel[5] [6] - Muscle meat of eel (*Anguilla anguilla)* and products thereof	4 pg/g whole weight 4 pg/g whole weight	8 pg/g whole weight 12 pg/g whole weight
5.3 Milk[7] and milk products, including butter fat	3 pg/g fat[4]	6 pg/g fat[4]
5.4 Hen eggs and egg products [8]	3 pg/g fat[4]	6 pg/g fat[4]
5.5 Oils and fats - Animal fat - of ruminants - of poultry and farmed game - of pigs - mixed animal fats - Vegetable oil and fats - marine oil (fish body oil, fish liver oil and oils of other marine organisms intended for human consumption)	 3 pg/g fat 2 pg/g fat 1 pg/g fat 2 pg/g fat 0.75 pg/g fat 2 pg/g fat	 4.5 pg/g fat 4 pg/g fat 1.5 pg/g fat 3 pg/g fat 1.5 pg/g fat 10 pg/g fat

(1) Applicable from 4th November, 2006.

(2) Upperbound concentrations: Upperbound concentrations are calculated on the assumption that the values of the different congeners below the limit of quantification are equal to the limit of quantification.

(3) Meat of bovine animals, sheep, pig, poultry and farmed game as defined in Annex I to Regulation (EC) No 853/2004 of the European Parliament and of the Council (OJ L 139, 30.4.2004. Corrected version in OJ L 226, 25.6.2004, p. 22) but not including edible offal as defined in that Annex.

(4) The maximum levels are not applicable for food products containing < 1 % fat.

(5) Muscle meat of fish and fishery products as defined in categories (a), (b), (c), (e) and (f) of the list in Article 1 of Council Regulation (EC) No 104/2000 (OJ L 17, 21.1.2000, p. 22. Regulation as amended by the 2003 Act of Accession). The maximum level applies to crustaceans, excluding the brown meat of crab and excluding head and thorax meat of lobster and similar large crustaceans (Nephropidae and Palinuridae) and to cephalopods without viscera.

(6) Where fish are intended to be eaten whole, the maximum level applies to the whole fish.

(7) Milk (raw milk, milk for the manufacture of milk-based products and heat-treated milk as defined in Annex I to Regulation (EC) No 853/2004.

(8) Hen eggs and egg products as defined in Annex I to Regulation (EC) No 853/2004.

There are currently no maximum levels for non-dioxin like PCBs set by the EC, however, a number of EC Member-States have set national levels for individual or sum of the 7 indicator PCBs. The most stringent level has been set in Belgium for the sum of 7 indicator PCBs with a maximum level of 75 µg/kg product for "Fish, including shellfish and crustaceans and foodstuffs derived thereof" (EU Working Document, 2005). The European Commission is currently considering the regulation of non-dioxin like PCBs, possibly via setting maximum levels for the 6 indicator PCBs.

There are also no EU maximum limits for BFRs in food. Tolerable daily intakes (TDIs) have not been derived, primarily due to limited toxicological data for BFRs and the associated uncertainties with such studies. Considerably more work is required internationally on the toxicology and risk assessment of BFRs.

3. Study Outline

The present study was undertaken to investigate the current levels of dioxins, furans, PCBs and PBDEs in fishery produce available on the Irish market and thereby increase the available data on the occurrence of these contaminants in such produce.

3.1 Materials and Methods

For this survey a total of 70 samples were collected in the 2nd half of 2004, comprising the following species and retail groupings: (1) Farmed Atlantic salmon, (2) Wild Atlantic salmon, (3) Fresh herring, (4) Fresh mackerel, (5) Fresh tuna, (6) Fresh shellfish, (7) Smoked farmed salmon, (8) Canned salmon, (9) Canned tuna, (10) Canned herring, (11) Canned sardines and (12) Canned mackerel.

Groups 1 to 6 were collected by staff of the Marine Institute from landings at Irish ports and production level (farmed salmon), group 7 was provided by An Board Iascaigh Mhara and the remainder were sampled by officers of the Food Safety Authority of Ireland at retail level. Fresh tuna and wild salmon samples were analysed individually, all other groupings composed a number of pooled sub-samples (see Table 3). Capture locations and retail batch origin details were collected as appropriate.

Table 3 Sample Details

Common Name	Species	N	sub-N	Origin	Details		
Oysters	*Crassostrea gigas*	5	25	Ireland	Cultivated pacific oysters	raw	shelled
Herring	*Clupea harengus*	4	20	Ireland	fresh herring	raw	skin off
Mackerel	*Scomber scombrus*	5	20	Ireland	fresh mackerel	raw	skin off
Albacore Tuna	*Thunnus alunga*	5	1	Ireland	fresh tuna	raw	skin off
Atlantic Salmon	*Salmo salar*	10	1	Ireland	wild salmon	raw	skin off
Atlantic Salmon	*Salmo salar*	15	5	Ireland	farmed salmon	raw	skin off
Atlantic Salmon	*Salmo salar*	10	5	Ireland	smoked salmon	smoked	skin off
Herring	*Clupea harengus*	2	5	Retail	Tinned herring (kippers)	tinned	skin on
Mackerel	*Scomber scombrus*	2	5	Retail	Tinned mackerel (brine)	tinned	skin on
Pink & red Salmon	n.a.	5	5	Retail	tinned salmon	tinned	skin off
Sardines	n.a.	1	5	Retail	tinned sardines (oil)	tinned	skin on
Skipjack Tuna	n.a.	5	5	Retail	tinned tuna	tinned	skin off

N = number of pooled (individuals) analysed.
Sub-N = number of individuals in a pooled sample.
n.a. = exact species information not available

3.2 Analytes included in the survey

3.2.1 PCDDs/PCDFs and PCBs

The 17 PCDD/PCDF congeners of toxicological concern are shown in Table 1. The following PCB congeners, including the 12 dioxin-like PCBs[3] and the 7 indicator PCBs[4] were also analysed in this study.

- PCB 18
- PCB 28
- PCB 31
- PCB 33
- PCB 37
- PCB 41
- PCB 44
- PCB 47
- PCB 49
- PCB 51
- PCB 52
- PCB 60
- PCB 66
- PCB 74
- PCB 77
- PCB 81
- PCB 87
- PCB 99
- PCB 101
- PCB 105
- PCB 110
- PCB 114
- PCB 118
- PCB 123
- PCB 126
- PCB 138
- PCB 141
- PCB 151
- PCB 153
- PCB 156
- PCB 157
- PCB 167
- PCB 169
- PCB 180
- PCB 183
- PCB 185
- PCB 187
- PCB 189
- PCB 191
- PCB 193
- PCB 194
- PCB 201
- PCB 203
- PCB 206

[3] (PCBs 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, 189)
[4] (PCBs 28, 52, 101, 118, 138, 153 and 180)

3.2.2 Brominated flame retardants

The following 16 PBDE congeners were analysed in this study:

- BDE-17
- BDE-28
- BDE-47
- BDE-49
- BDE-66
- BDE-71
- BDE-77
- BDE-85
- BDE-99
- BDE-100
- BDE-119
- BDE-126
- BDE138
- BDE153
- BDE 154
- BDE-183

The isomers of hexabromocyclododecane (α-HBCD, β-HBCD and γ-HBCD) were analysed in a subset of samples in this study. Isomer specific analysis was completed on 4 farmed salmon, 1 smoked salmon, 2 tinned tuna, 1 wild tuna (albacore) and 1 tinned mackerel sample.

3.3 Methodology

Sample preparation

All samples were prepared in the Marine Institute. Skin was removed from all samples with the exception of tinned samples. Subcutaneous lipid was removed from skin, added back to samples and samples were aggregated as appropriate (see Table 3). Muscle tissue samples were then homogenised. Total lipid content was determined by the Marine Institute using the Smedes method (Smedes, 1999). Frozen homogenates were analysed for PCDD/F, PCBs and PBDEs by Eurofins Europe (GfA), Germany, and for HBCD at the Central Science Laboratory (CSL), York England, under contract to FSAI. Moisture content determination was carried out at the Marine Institute.

Sample Analysis

Analysis of PCDD/Fs and PCBs was performed according to the EN ISO 17025 accredited methods GfA QMA 504-191/203/205. The analytical methodology is in compliance with the requirement for the HRGC/HRMS confirmatory analysis of food for PCDD/Fs and PCBs as laid down by EU Directive 2002/69 (European Commission, 2002). For the analysis of PBDEs, a GfA-established GC/MS method was used while HBCD isomers were analysed by CSL using LC-MS/MS. Further details on analytical methodology and quality assurance are reported in the Appendix.

4. Results

4.1 Dioxins, furans and PCBs

Table 4 presents summary information on the levels of PCDD/Fs, dioxin-like PCBs and indicator PCBs measured in fishery products available in Ireland sampled during this study.

Results are expressed as total WHO-TEQs in ng/kg whole (fresh) weight for PCDD/Fs and dioxin-like PCBs, additionally the sum of PCDD/Fs and dioxin-like PCBs are reported. The sum of the 7 indicator PCBs are reported in µg/kg whole weight. In each case results are presented as upper-bound values.

Table 4 Upper-bound levels (<LOQ = LOQ) of PCDD/Fs, dioxin-like PCBs and total TEQs and sum of 7 indicator PCBs in fishery products (whole weight)

Sample	N (subN)	Statistics	Σdl-PCBs&PCDD/F	PCDD/F	dl-PCBs	7 indicator PCBs
			WHO TEQs ng/kg			µg/kg
Wild Atlantic salmon	10(1)	Mean	0.80	0.34	0.46	5.49
		Median	0.76	0.32	0.45	5.67
		Std.Dev.	0.26	0.14	0.12	1.10
		Minimum	0.41	0.13	0.28	3.25
		Maximum	1.30	0.61	0.69	6.85
Farmed Atlantic salmon*	15(5)	Mean	2.15	0.54	1.61	17.1
		Median	2.14	0.49	1.66	16.8
		Std. Dev.	0.46	0.17	0.30	3.64
		Minimum	1.22	0.25	0.97	8.34
		Maximum	2.86	0.82	2.04	23.9
Fresh tuna (albacore)	5(1)	Mean	0.90	0.16	0.74	8.70
		Median	0.99	0.16	0.81	9.30
		Std. Dev.	0.21	0.05	0.20	2.72
		Minimum	0.61	0.11	0.50	5.65
		Maximum	1.12	0.23	0.96	12.3
Fresh herring	4(10)	Mean	1.02	0.42	0.60	7.68
		Median	1.03	0.42	0.60	7.56
		Std. Dev.	0.07	0.03	0.04	0.57
		Minimum	0.93	0.38	0.55	7.14
		Maximum	1.09	0.44	0.65	8.44
Fresh mackerel	4(10)	Mean	1.24	0.28	0.96	8.04
		Median	1.20	0.30	0.91	7.75
		Std. Dev.	0.28	0.05	0.24	2.77
		Minimum	0.97	0.21	0.76	5.22
		Maximum	1.58	0.32	1.26	11.5
Oysters (*C.gigas*)	5(25)	Mean	0.37	0.21	0.16	11.6
		Median	0.24	0.13	0.14	13.3
		Std. Dev.	0.20	0.14	0.07	0.53
		Minimum	0.22	0.09	0.10	0.55
		Maximum	0.63	0.43	0.26	1.80
Smoked Atlantic salmon	11(5)	Mean	1.27	0.28	0.99	10. 6
		Median	1.27	0.26	1.01	10.8
		Std. Dev.	0.21	0.07	0.14	2.11
		Minimum	0.97	0.19	0.79	6.90
		Maximum	1.76	0.47	1.29	13.2

* 15 farmed salmon samples were collected from separate sites. Each sample contains 5 fish from one cage

Table 4 (cont'd) **Upper-bound levels (<LOQ = LOQ) of PCDD/Fs, dioxin-like PCBs and total TEQs and sum of 7 Indicator PCBs in fishery products (whole weight)**

Sample	N (subN)	Statistic	Σdl-PCBs&PCDD/F	PCDD/F	Dl-PCBs	7 Indicator PCBs
			WHO-TEQs ng/kg			pg/kg
Tinned pink salmon	3(5)	Mean	0.08	0.02	0.06	0.67
		Median	0.08	0.02	0.06	0.64
		Minimum	0.07	0.02	0.05	0.56
		Maximum	0.10	0.03	0.07	0.80
Tinned red salmon	2(5)	Mean	0.48	0.19	0.29	2.67
		Median	0.48	0.19	0.29	2.67
		Minimum	0.34	0.14	0.20	1.99
		Maximum	0.61	0.24	0.37	3.35
Tinned tuna skipjack	5(5)	Mean	0.05	0.02	0.03	0.08
		Median	0.05	0.02	0.03	0.08
		Std. Dev.	0.01	0.003	0.01	0.02
		Minimum	0.04	0.01	0.03	0.06
		Maximum	0.06	0.02	0.04	0.12
Tinned mackerel	2(5)	Mean	1.04	0.31	0.73	5.87
		Median	1.04	0.31	0.73	5.87
		Minimum	1.02	0.29	0.72	5.77
		Maximum	1.06	0.33	0.73	5.97
Tinned herring	2(5)	Mean	0.82	0.38	0.44	5.17
		Median	0.82	0.38	0.44	5.17
		Minimum	0.81	0.38	0.43	5.09
		Maximum	0.82	0.38	0.44	5.25
Tinned sardines	1(5)	Mean	2.12	0.56	1.56	2.84

As reported in Table 4 the highest total TEQ (sum PCDD/F & dl-PCB) was observed in farmed salmon, at a mean concentration of 2.15 ng/kg whole weight, followed by tinned sardines (1 sample) with a mean TEQ level (sum PCDD/F & dl-PCB) of 2.12 ng/kg whole weight. The lowest level was observed in tinned tuna, with a mean concentration of 0.05 TEQ ng/kg whole weight. Fresh and tinned herring and mackerel showed levels within similar ranges, whereas tinned salmon and tuna generally showed lower levels of contamination, which may be attributed to differences in species, origin and fat content of the fish compared to their fresh counterparts. Significant differences ($p<0.003$) in dioxin concentrations were observed between wild and farmed salmon samples in this study, with wild salmon on average showing 40% lower dioxin levels than its farmed counterpart. Even larger differences were observed for dl-PCBs with levels being on average about 70% lower in wild salmon.

The data are also presented in graphical form in

Figure **1**, while Figure 2 provides an overview of mean concentrations of indicator PCBs in the fish species covered by this survey.

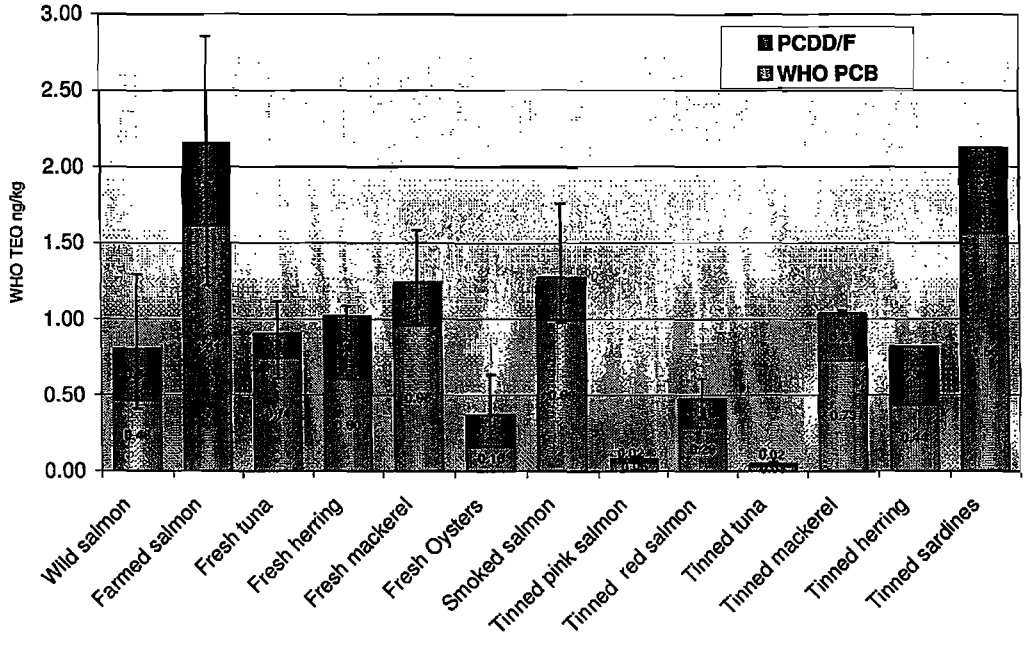


Figure 1 **Mean upper-bound WHO TEQ PCDD/F & dl-PCB ng/kg whole weight in fish species (bars represent min and max levels)**

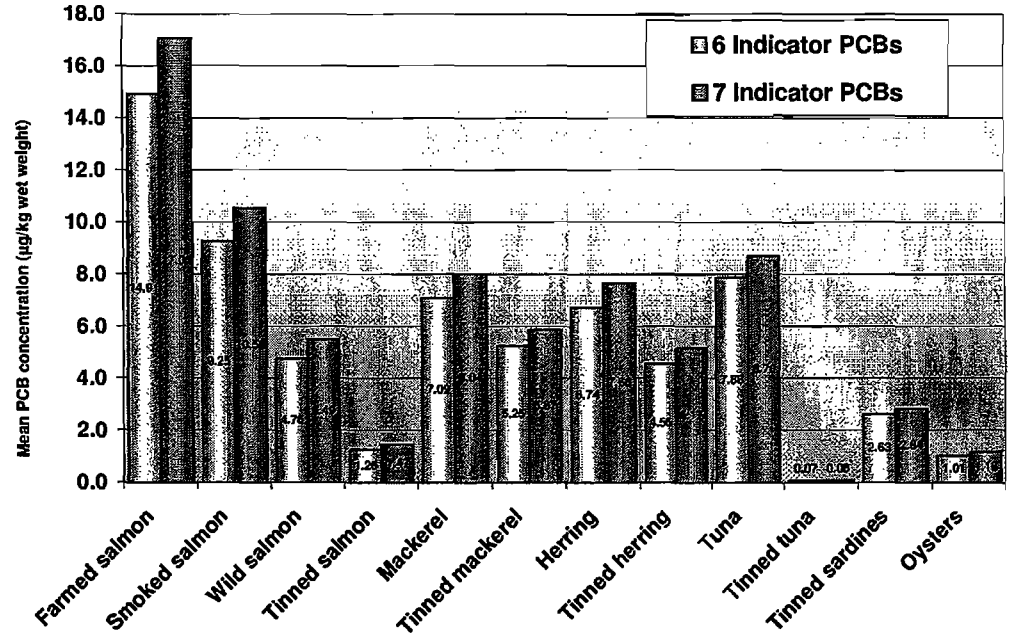


Figure 2 **Mean concentration of Σ 7 Indicator PCBs and Σ 6 Indicator PCBs (µg/kg fresh weight, upper-bound)**

Levels of lipophilic contaminants such as PCDDs/PCDFs and PCBs are generally recognised to increase in fish species as the lipid content of the sample increases, supporting the contention that oily fish tend to accumulate lipophilic contaminants to a higher degree than non-oily fish.

Table 5 summarises the mean lipid data analysed by the Marine Institute for all the species groupings covered in this survey. Comparison of the lipid content with the contaminant data shows that levels of contaminants were somewhat higher in the oily fish examined in this survey, such as farmed salmon and herring, than in the low fat products such as shellfish, tinned and fresh tuna, supporting this contention.

Table 5 Mean total lipid levels (%) determined in fish species covered in this survey

Fish product	Average Lipid (%)	Range (%)
Wild salmon	10.7	(5.8 - 12.7)
Tinned red salmon	6.7	(4.7 - 8.0)
Tined tuna	5.3	(0.7 - 12.5)
Smoked salmon	10.3	(9.2 - 11.6)
Tuna	10.1	(5.6 - 15.8)
Herring	13.0	(11.5 - 14.4)
Farmed salmon	14.5	(10.4 - 18.4)
Mackerel	10.1	(7.0 - 13.0)
Tinned sardines	29.5	NA
Tinned mackerel	30.1	(28.6 - 31.6)
Tinned herring	16.0	(15.1 - 16.9)
Oysters	2.5	(2.0 - 3.3)

NA =not applicable as n=1.

4.2 Brominated Flame Retardants

4.2.1 PBDEs

Of the 16 PBDE congeners analysed, only 7 congeners (BDEs 47, 49, 99, 100, 154, 66 and 28) were found to predominate. The most abundant congeners determined in all samples were BDEs-47, 49, 99, 100, 66, 28 and 154. BDEs-17, 153 and 119 were frequently below or close to the Limit of Quantification (LOQ) (0.01, 0.03, 0.02 µg/kg whole (wet) weight respectively) except for farmed and smoked salmon with average BDE-153 levels of 0.07 and 0.05 µg/kg whole weight respectively. No sample showed levels of BDE-71, BDE-85, BDE-77, BDE-126, BDE-138, BDE-183 above the LOQ (0.01, 0.02, 0.01, 0.02, 0.03, 0.05 µg/kg whole weight respectively), with the exception of one shellfish sample (BDE 71 and 85). Table 7 presents an overview of the percentage of the individual BDEs quantified in all 70 samples analysed.

Table 6 presents calculated mean, minimum, median and maximum upper-bound levels for the sum of total PBDE congeners (16 congeners). Results are expressed on a whole weight basis.

Table 6 Upper-bound levels (<LOQ = LOQ) of Σ16PBDEs in fishery products (µg/kg whole weight)

Sample	N (sub-N)	Statistics	ΣPBDE	Sample	N (sub-N)	Statistics	ΣPBDE
Wild salmon	10(1)	Mean	0.86	Tinned pink salmon	3(5)	Mean	0.33
		Median	0.85			Median	0.33
		Minimum	0.70			Minimum	0.33
		Maximum	1.01			Maximum	0.34
Farmed salmon	15(5)	Mean	3.71	Tinned red salmon	2(5)	Mean	0.34
		Median	3.91			Median	0.34
		Minimum	2.42			Minimum	0.33
		Maximum	5.05			Maximum	0.35
Fresh tuna	5(1)	Mean	0.96	Tinned tuna	5(5)	Mean	0.31
		Median	0.97			Median	0.31
		Minimum	0.57			Minimum	0.31
		Maximum	1.36			Maximum	0.31
Fresh herring	4(10)	Mean	1.67	Tinned mackerel	2(5)	Mean	1.56
		Median	1.65			Minimum	1.26
		Minimum	1.61			Maximum	1.86
		Maximum	1.77				
Fresh mackerel	5(10)	Mean	1.35	Tinned herring	2(5)	Mean	1.50
		Median	1.33			Minimum	1.46
		Minimum	0.93			Maximum	1.53
		Maximum	1.70				
Shellfish (C.*gigas*)	5(25)	Mean	1.75	Tinned sardines	1(5)	Mean	0.34
		Median	1.45				
		Minimum	0.69				
		Maximum	4.21				
Smoked salmon	11(5)	Mean	2.39				
		Median	2.44				
		Minimum	1.69				
		Maximum	3.58				

*Sub-N = denotes the number of individual samples aggregated to provide a single analytical sample

Table 7 Overview of BDE congener occurrence above the quantifiable level in fish samples

BDE No	No Samples >LOQ	Species	%
47	65	all except tinned tuna	92.9
49, 99, 100	59	all except tinned tuna, tinned salmon	84.3
66, 28, 154	57	all except tinned tuna, tinned salmon, shellfish	81.4
153	30	mostly farmed salmon & smoked salmon	42.9
17	18	mostly in smoked salmon, farmed salmon, tinned mackerel at LOQ, shellfish ~0.03	25.7
119	5	mostly farmed and smoked salmon	7.1
71, 85	1	in shellfish	1.4
77, 126, 138, 183	0	not quantified in any sample	0

The highest concentrations of total PBDE (sum 16) were observed in farmed and smoked (farmed) Atlantic salmon (3.71 and 2.39 µg/kg whole weight respectively). Fresh mackerel, fresh herring and shellfish showed lower levels (1.35, 1.67 and 1.75, µg/kg whole weight upper-bound means respectively) as did

fresh tuna and wild salmon (0.96 and 0.86 µg/kg whole weight respectively) which showed the lowest levels in all fresh fish included in this survey. Levels in canned tuna were all below the limit of quantification.

Comparable contaminant concentrations were observed for canned fish (herring or mackerel) and their corresponding fresh samples. Results for canned sardines were also comparably low. The data are also presented in graphical form in Figure 3 below.

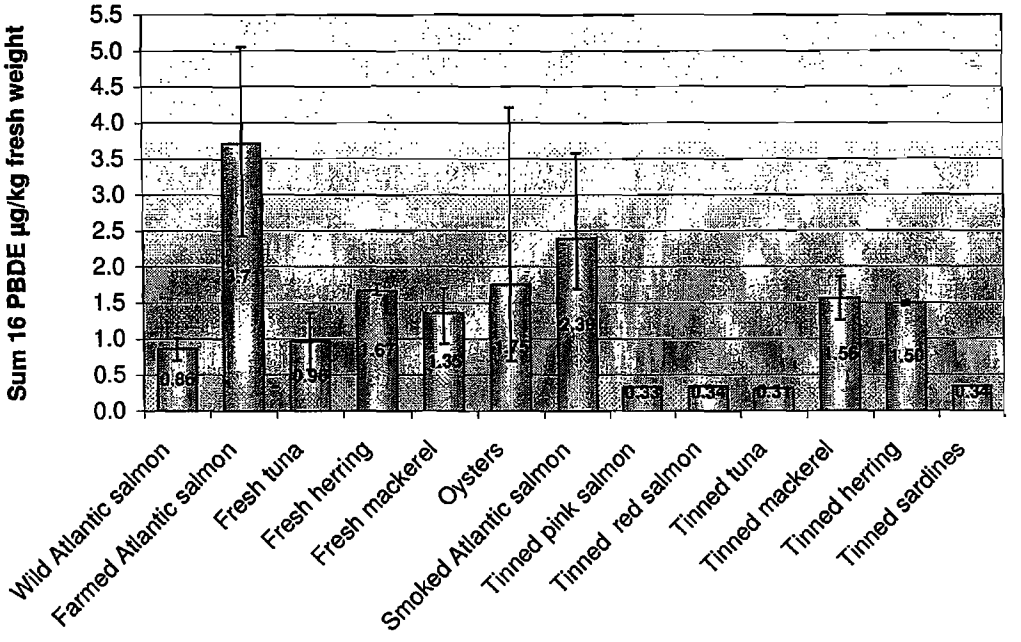


Figure 3 **Mean Upperbound concentration Σ16 PBDE in fish samples expressed in µg/kg whole weight (bars represent min and max levels)**

4.2.2 HBCD

Total and isomer specific HBCD levels in 10 samples are presented in Table 8.

Table 8 **Levels of α β and γ-HBCD isomers and total (upperbound) HBCD in individual samples of fishery produce on the Irish marketplace (µg/kg wet weight)**

Sample Ref	Matrix	αHBCD	βHBCD	γHBCD	Total
MSC/04/1120	Tinned salmon	<0.073	<0.014	<0.016	<0.10
MSC/04/1129	Farmed salmon	1.20	<0.049	<0.068	1.32
MSC/04/1141	Farmed salmon	0.88	<0.043	0.16	1.08
MSC/04/1124	Tinned tuna	<0.073	<0.014	<0.016	<0.10
MSC/04/1128	Tinned tuna	<0.073	<0.014	<0.016	<0.10
MSC/04/1147	Smoked salmon	0.55	0.044	<0.084	0.68
MSC/04/1132	Farmed salmon	2.30	0.10	0.27	2.67
MSC/04/1137	Farmed salmon	1.30	<0.053	<0.016	1.37
MSC/05/0003	Tinned mackerel	0.87	<0.014	0.13	1.01
MSC/04/1176	Tuna	0.28	<0.014	<0.016	0.31

5. Discussion

The results of this study, undertaken to investigate levels of dioxins (PCDDs), furans (PCDFs), PCBs, PBDEs and HBCD in fish and fishery products available on the Irish market place, show that levels in the food commodities analysed were generally low, and were well below the maximum limits laid down for PCDDs/PCDFs and dioxin-like PCBs in Council Regulation 1881/2006 .

There were marked differences in dioxin levels between wild and farmed salmon samples in this study, with wild salmon on average showing 40% lower dioxin levels than its farmed counterpart. Even larger differences were observed for dl-PCBs, with levels being on average about 70% lower in wild salmon. A general reduction in dioxin and PCB contamination in farmed fish can, however, be observed, when comparing levels to a previous survey (FSAI, 2002a).

This previous study, carried out in 2001, investigated levels of PCDD/F and dl-PCBs in wild and farmed salmon. Direct comparison with this previous survey is difficult due to differences in analytical limits of detection between the two surveys, however for a number of congeners determined above the limit of detection in both studies some comparisons can be made. For 2,3,7,8 TCDD, the most toxic of the dioxin congeners, a significant reduction ($p<0.002$) could be observed. Table 9 provides an overview of the percentage reduction observed for the congeners detected above LOQs in both surveys. Taking the above mentioned limitations into account an overall reduction of 38% ($p<0.001$) can be calculated for Sum WHO TEQ PCDD/F in the 2004 farmed salmon samples versus the 2001 farmed salmon samples.

Table 9 Percentage (%) reduction in levels of specific PCDD and PCDF congeners in 15 farmed salmon samples analysed in 2004 compared to 15 farmed salmon samples analysed in 2001.

Congener	Reduction from 2001 survey (%)
2,3,7,8-Tetra-CDD	37.6
1,2,3,7,8-Penta-CDD	40.5
1,2,3,6,7,8-Hexa-CDD	35.4
2,3,7,8-Tetra-CDF	45.0
1,2,3,7,8-Penta-CDF	42.1
2,3,4,7,8-Penta-CDF	27.3

Significant ($P<0.001$) reductions of approximately 50% could also be observed for dl-PCBs. These figures indicate a general reduction in dioxin and dl-PCB contamination in Irish farmed salmon, which may in part be attributable to source-directed measures adopted by the industry in the intervening period, such as changes in sources or species of fish oils in fish feeds or changes in feeding management regimes, amongst other possibilities.

In relation to the non-dioxin-like PCBs, the concentrations found in Irish farmed salmon in this survey are substantially below maximum levels for the so-called indicator PCBs (either sum of 6 or sum of 7) currently set in some EU Member States. Results concur with results of routine monitoring of indicator PCBs in

farmed and wild fish carried out by the Marine Institute. As with the PCDD/F and dl-PCBs, a reduction of 48% in the levels of the indicator PCBs in farmed salmon was observed between the study carried out in 2001 and this study ($p<0.001$), again indicative of risk management measures adopted by the industry, such as changes in sources or species of fish oils in fish feeds or changes in feeding management regimes.

Comparison of the fat content with the contaminant data shows that levels of contaminants were somewhat higher in the oily fish examined in this survey, such as farmed salmon and herring compared with the low fat products such as shellfish, tinned tuna and salmon. However, there are particular health benefits associated with consuming oily fish due to their high contents of polyunsaturated fatty acids (PUFAs). The FSAI will report separately on the levels of PUFAs found in the various species examined in this study and the risks and benefits of consumption of oily fish including farmed salmon.

PBDE results in farmed salmon were similar to those recorded in a smaller Marine Institute study completed in 2004 (Marine Institute, 2004c), in which results ranged from 2.28 to 4.61 (mean 3.05) µg/kg whole weight for the sum of 17 individual PBDEs. Levels reported by Hites and co-workers (Hites *et al,* 2004) in retail farmed salmon range between 0.6 to 3.9 µg /kg whole weight and the range was 1.25 to 3.9 µg/kg in all confirmed farmed fish. These are comparable to the levels found in the present study. However, differences exist in the number of congeners determined in the various studies listed and therefore direct comparisons of the datasets cannot be made.

The higher PBDE concentrations observed in farmed Atlantic salmon versus wild Atlantic salmon may in part be attributable to differences in feed regime and sources. Differences observed in fresh salmon and fresh tuna versus canned salmon and canned tuna may in part be due to differences in species types sampled, for example skipjack tuna is the dominant species used for canning and albacore tuna is the most widely marketed fresh species in Ireland. Fish processing practices may also result in such differences.

The size/age, diet, lipid content and trophic status of the fish are also likely to be contributing factors. Furthermore, the majority of canned samples available on the Irish market differ in geographic origin from the fresh samples analysed, with canned samples mainly being imported/originating from countries bordering the Indian Ocean and the North Pacific Ocean.

Total HBCD levels were low in all samples and levels in farmed salmon are in agreement with those of a previous Marine Institute survey (1.17 ± 0.26) (Marine Institute, 2004c).

A study of BFR-contaminated trout and eel from the Skerne-Tees river system was carried out by the UK Food Standards Agency (Food Standards Agency, 2004). Levels in the fish from the UK study were much higher than those determined in this present study and the study completed by the Marine Institute in 2004. In the UK study, however, the observed contamination was linked to a specific source, a BFR manufacturing facility located on the River Skerne which closed in December 2003.

The Independent Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) UK concluded that the estimated dietary intakes of PBDEs and HBCD from the consumption of a weekly single portion of fish from the Skerne-Tees river system were unlikely to represent a risk to health. The results of this present study have shown that levels of PBDEs and HBCD are over one and three orders of magnitude lower respectively than the levels at which COT assessed dietary intake. This would suggest that there is a correspondingly greater safety margin for consumers of farmed salmon and other fishery produce as determined in both this study and the MI study in 2004[5].

A more recent survey conducted in the UK (Food Standards Agency, 2006) showed levels of PBDE congeners in tinned and farmed salmon, tinned herring and mackerel and oysters comparable to those found in this present survey, whereas fresh Irish herring and mackerel and wild Atlantic salmon showed lower levels in this survey compared with the UK survey. Fresh tuna samples, originating from the waters south west of Ireland, displayed higher levels than those found in the UK survey.

6. Conclusions

This study has demonstrated that levels of dioxins, furans, PCBs in Irish seafood are in general well below the relevant legislative limits for these contaminants. Levels of the indicator PCBs 28, 52, 101, 118, 138, 153, and 180 are similarly low, as are levels of those brominated flame retardants measured in the study.

The results of the study are in line with those from previous FSAI studies on dioxin levels in fish and also studies on meat, milk, and eggs, and confirm that dioxin levels in these foods are relatively low compared with data for similar products from more industrialised countries in the European Union. FSAI is pleased to report these results and to note that Irish produce readily complies with legislation in this area. These findings support the interpretation that exposure of consumers of Irish food to dioxins is likely to be lower than the European average, a conclusion which should be reassuring to Irish consumers.

On the basis of these results, the FSAI considers that there is no need to amend existing advice on fish consumption, namely that consumers should consume two portions of fish per week, one of which should be oily (e.g. salmon, herring or mackerel).

[5] It should be noted that COT's conclusions were tentative due to uncertainties surrounding the toxicological database and exposure assessment. Additionally, the MI study only tested a limited number of samples.

7. Abbreviations

Ah receptor	aryl hydrocarbon (Ah) receptor
b.w.	body weight
congener	term referring to one of many configurations of a common chemical structure
DCMNR	Department of Communication, Marine and Natural Resources
EC	European Community
EFSA	European Food Safety Authority
FSAI	Food Safety Authority of Ireland
HSE	Health Service Executive (formerly the Health Boards)
JECFA	FAO/WHO Joint Expert Committee Food Additives and Contaminants
LOD	Limit of Detection
LOQ	Limit of Quantification/Quantitation
Lower-bound	Analytical results below the LOD are set at zero for calculation purposes
MI	Marine Institute
ng	nanogram (0.000000001 g)
pg	picogram (0.000000000001 g)
ppb	parts per billion (equal to ng/g or µg/kg)
PUFA	poly unsaturated fatty acids
TEF	toxic equivalency factor
TEQ	toxicity equivalent
PTMI	Provisional Tolerable Monthly Intake
SCF	Scientific Committee of Food
TWI	Tolerable Weekly Intake
TDI	Tolerable Daily Intake
µg	microgram (0.000001 g)
Upper-bound	Analytical results below the LOQ are set at the LOQ value for calculation purposes
w.w.	wet weight or whole weight
BFRs	Brominated flame retardants
HBCD	Hexabromocyclododecane
PCDDs	polychlorinated dibenzo-*p*-dioxins
PCDFs	polychlorinated dibenzofurans
PCBs	polychlorinated biphenyls
PBDEs	polybrominated diphenylethers
PCDD/F	abbreviation for PCDDs and PCDFs
dl-PCB	dioxin-like PCB
ndl-PCB	non-dioxin-like PCB
TCB	tetrachlorobiphenyl
PnCB	pentachlorobiphenyl
HxCB	hexachlorobiphenyl
HpCB	heptachlorobiphenyl
PnCDD	pentachlorodibenzo-*p*-dioxin
HxCDD	hexachlorodibenzo-*p*-dioxin
HpCDD	heptachlorodibenzo-*p*-dioxin
OCDD	octachlorodibenzo-*p*-dioxin
PnCDF	pentachlorodibenzofuran
HxCDF	hexachlorodibenzofuran
HpCDF	heptachlorodibenzofuran
OCDF	octachlorodibenzofuran
Σ7PCB	Sum of 7 indicator PCBs (28, 52, 101, 118, 138, 153 and 180)
Σ6PCB	Sum of 6 indicator PCBs(28, 52, 101,138, 153 and 180)
Σ	Sum
BB	body burden

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9. Appendix

9.1 Methods of Analysis

Fat extraction

Tissue homogenates of the fish samples were freeze-dried and further homogenized by means of grinding. The fat extraction was performed by means of Accelerated Solvent Extraction (ASE) using an ASE 300 instrument of Dionex Corp., Sunnyvale, CA, USA. For fat extraction, 20 g of the freeze-dried sample material was mixed with about 15 g of diatomaceous earth and filled into the ASE extraction cartridge. Prior to the start of the extraction, a surrogate standard (50 pg ^{13}C12-labelled 1,2,3,4-TetraCDD) was added to the sample material in order to control the extraction efficiency. After ASE extraction the solvents were removed from the fat extract by means of a rotary evaporator which was operated under defined conditions. The fat fraction finally was determined gravimetrically.

Analysis of fish samples for PCDD/Fs PCDD/F

Analysis was performed according to the EN ISO 17025 accredited methods GfA QMA 504-191/203/205. The analytical methodology is in compliance with the requirement for the HRGC/HRMS confirmatory analysis of food for PCDD/Fs and PCBs as laid down by the EU directive 2002/69 and its amendment 2004/44 from April 2004. Each analysis included the determination of the seventeen PCDD/F congeners with 2,3,7,8-chloro-substitution. For PCDD/F analysis, sixteen ^{13}C12-labelled PCDD/F congeners were added to the fat extract of each sample as internal standards.

For separation of the PCDF/Ds from the fish lipid, the total fat extract was dissolved in 14 ml of hexane and subsequently injected into an automated clean-up system, (Power-Prep FMS, Fluid Management Systems Inc., Waltham, MA, USA). PCB-free Power-Prep Columns were used for the automated clean-up. The hexane solution was percolated through a high capacity disposable silica column, a multilayer silica column and a basic alumina column. Final separation of PCDF/Ds / non-ortho PCBs and other PCBs was achieved by means of a carbon column. Prior to the instrumental analysis, two further PCDD standards (^{13}C6-1,2,3,4-TetraCDD and ^{13}C12-1,2,3,7,8,9-HexaCDD) were added to the PCDD/F fraction to determine the recovery of the ^{13}C12-labelled internal PCDD/F standards through the clean-up. For the PCDD/F determination, a capillary gas chromatograph (HRGC, HP 5890) equipped with a PTV injector and connected to a high resolution mass spectrometer (HRMS, VG-AutoSpec) was used.

Prior to starting analysis, a HRMS tune was carried out to adjust the instrumental performance (at least once per analysis batch, including mass axis calibration, adjustment of mass resolution and sensitivity). The instrument sensitivity was then checked by means of native PCDD/F standards. A mixture of the sixteen ^{13}C12-labelled standards mentioned above and the seventeen native standards were always injected to determine the relative retention times and the relative response factors for identification and quantification.

During sample analysis, the stability of the mass focus was assured by means of perfluorokerosene locked masses.

The limits of quantification (LOQs) for the determination of individual PCDD/Fs in the fish samples were in general between 0.002 pg/g whole weight (for 2,3,7,8-TetraCDD) and 0.2 pg/g whole weight for OctaCDD/F. Limits of detection (LODs) are usually a factor of three lower. However, only LOQs are reported.

Analysis of fish samples for PCBs

Analyses were performed by application of the EN ISO 17025 accredited methods QMA 504-191/203/251. The analytical procedure is in compliance with the requirements for the PCDD/F and PCB analysis of food by means of HRGC/HRMS laid down in the EU directive 2002/69 and it's amendment 2004/44 from April 2004. The analyses covered the determination of the twelve dioxin-like PCB congeners for which TEFs were established by the WHO in 1998 plus seven indicator PCBs and further 29 PCB congeners as specified in the FSAI request.

Similar to the dioxin analysis, for each native dioxin-like or indicator PCB congener to be determined the corresponding ^{13}C12-labelled PCB was added as internal standard to the extract (isotope dilution). The remaining PCB congeners are also quantified by means of these and other internal ^{13}C-labelled PCB standards using response factors relative to an internal standard with the same degree of chlorination. After fat and matrix separation by means of the silica and alumina columns as described above, non-ortho PCBs and PCDD/Fs were separated from the other PCBs by means of a carbon column. The fractions containing the non-ortho PCBs and the other PCBs were analysed in separate GC/MS runs. For PCB detection, a capillary gas chromatograph (HRGC, HP 5890) equipped with a split/splitless injector and connected to a high-resolution mass spectrometer (HRMS, VGAutoSpec) was also used. The procedures for the instrument tuning, the determination of relative retention times and response factors, and the locked mass check were basically the same as described for the PCDD/Fs, however, adjusted to the PCB determination. On the basis of the GC/MS system used for the PCB detection co-elution of the following PCB congeners is observed:

PCB analyte	PCB co-eluting
PCB 33	PCB 20
PCB 41	PCB 71
PCB 66	PCB 81
PCB 123	PCB 106
PCB 180	PCB 193
PCB 187	PCB 182

Consequently, concentrations determined for these 6 PCB congeners can be considered as maximum values. The limits of quantification (LOQs) were in general in the range of 0.2 and 0.8 pg/g whole weight for the non-ortho PCBs 77, 81, 126 and 169. For the indicator and the other PCB congeners LOQs between 0.2 and 10 pg/g whole weight were generally achieved. Detection limits are lower; however, the limits of quantification are reported.

Analysis of fish samples for PBDEs

For the analysis of brominated flame retardant compounds in the fish samples, a GfA established GC/MS method was used. For the determination of PBDEs four ^{13}C12-labeled PBDE congeners were added to an aliquot of the fat extract of the sample as internal standard.

Extract aliquots were treated with sulphuric acid and further cleaned-up by liquid/solid chromatography. A recovery standard was added prior to the instrumental analysis using capillary gas chromatography (HRGC) coupled with low resolution mass spectrometry (LRMS). The gas chromatographic separation was performed on a 30m HP-5 column with 0.32 mm inner diameter and 0.1 mm film thickness.

The native PBDE congeners were quantified via the internal isotope labelled PBDE standards. Relative response factors of native to isotope labelled PBDEs were determined by means of calibration mixtures analyzed within each analysis sequence. LOQs were in the range of 0.01 ng/g and 0.05 ng/g whole weight for the Tri- to HeptaBDE congeners. The limits of detection (LODs) are lower however, the limits of quantification are reported.

Analysis of fish samples for HBCD:

Samples were spiked with deuterated internal standards and with the analytes of interest. Each sample was then mixed with anhydrous sodium sulphate, hexane:dichloromethane and acid modified silica was added. The filtrate and washings were collected reduced in volume and then quantitatively transferred to a glass vial and evaporated to dryness. Methanol and water was added and the solution was transferred to a HPLC-MS/MS vial for analysis using a Sunfire C-18 150 x 2.1 mm, particle size 3.5 µm HPLC column Detection was carried out by MS/MS in multiple reaction monitoring mode (MRM) mode. Quantification was completed by means of internal standard recovery correction.

9.2 Quality assurance/control

The method implemented quality assurance and quality control followed the basic requirements of international standards for the analysis of Dioxins and PCBs at low concentration levels by using isotope dilution and high resolution mass spectrometry (e.g. EC directive 2002/69, EN 1948, EPA 1613). Furthermore, a series of additional tests and analyses were performed to assure quality within this project.

Duplicate analyses, to verify precision of analyte quantification were performed with a set of five samples for PCDD/Fs and PCBs. In all cases, repeat analyses confirmed the first result.

Accuracy of PCDD/F and PCB analysis was verified by analysing a certified "contaminated fish reference material" (CIL EDF-2525) within this project. To assess the performance of the BFR analysis, an in-house reference material (Fish oil from Quasimeme Laboratory Proficiency Test, Round 33 BFR DE8, July 2003) was used.

The relative deviation of the analytically determined TEQ from the assigned value was 11 % for WHO-PCDD/F-TEQ (incl. LOQ) and 0.1 % WHO-PCB-TEQ (incl. LOQ).

The recoveries of the internal ^{13}C12-labelled PCDD/F, PCB and PBDE standards are in general in the range of 70 to 120 % for the measurements of this study, demonstrating the appropriateness of the applied methods for the analysis of Dioxins/Furans and PCBs in fish.

Expanded measurement uncertainties were derived for the determination of PCDD/F and PCB in fatty food. Uncertainties were calculated on the basis of the "Guide to the expression of uncertainty in measurement (GUM)"12 and the EURACHEM/CITAC Guide "Quantifying uncertainty in analytical Measurement (QUAM)"13. The expanded uncertainties calculated here using a coverage factor of 2 (level of confidence of approximately 95 %).

For PCDD/F TEQs relative expanded uncertainties were calculated to be 12 % and for the PCB TEQs 13%. The Eurofins / GfA laboratory, Münster is accredited according to DIN EN ISO/IEC 17025:2000 and its quality management system complies with the requirements of the DIN EN ISO 9002:1994.

Further to these QA procedures the Eurofins / GfA laboratory has been performing Dioxin and PCB analyses in various matrices for nearly 20 years and has steadily and regularly taken part in external proficiency tests and interlaboratory comparisons.

No certified reference materials available for HBCD analysis in food matrices so an in-house reference material (IHRM) was prepared and analysed in duplicate in each batch. The values obtained are in close agreement with those expected and the relative standard deviations are all less than 2%. Each batch contained two procedural blanks, two IHRMs, a blank and a spiked sunflower oil to allow recovery correction calculations for the IHRM. Analytical recoveries were within the following ranges: 74 - 117% for αHBCD, 84 - 115% for βHBCD and 70 - 120% for γHBCD. The limits of detection (LODs) were calculated as the highest level of the analytes detected in the procedural blank samples.

The Marine Institute is ISO17025 accredited for total lipid determination (Smedes) method and moisture content in marine biota.

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Polybrominated Diphenyl Ethers (PBDEs) in Foodstuffs: Human Exposure through the Diet

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Polybrominated diphenyl ethers (PBDEs) are used as flame retardants in a variety of materials, including synthetic polymers and textiles. Although these chemicals have been detected in environmental samples and human tissues, there is little information about human exposure to PBDEs through the diet. In the present study, we determined the concentrations of PBDEs in a number of food samples acquired in Catalonia (Spain) during 2000. The dietary intake of PBDEs was estimated for the general population living in this Spanish region. The highest PBDE concentrations were found in oils and fats, fish and shellfish, meat and meat products, and eggs, while the lowest levels corresponded to fruits, vegetables, and tubers. The dietary intake of PBDEs for an adult male was 97.3 ng/day (assuming not detected (ND) = $^1/_2$ limit of detection (LOD)) or 81.9 ng/day (assuming ND = 0) The greatest contribution to these values corresponded to fish and shellfish, with approximately one-third of the total intake. TetraBDEs and pentaBDEs were the homologues showing the highest percentages of contribution to the sum of total PBDEs. The comparison of the current dietary intake with the suggested lowest observed adverse effect level value of 1 mg/kg/day for the most sensitive endpoints for toxic effects of PBDEs results in a safety factor over 5 orders of magnitude in relation to PBDE exposure from food.

KEYWORDS: Polybrominated diphenyl ethers (PBDEs); levels in food; dietary intake; general population; Catalonia, Spain

INTRODUCTION

Polybrominated diphenyl ethers (PBDEs) are dicyclic aromatic ethers with highly lipophilic characteristics. They are widely used as flame retardants, being added to different materials, such as plastics for electronic appliances, paints, and textiles, to prevent them for catching fire. Technical PBDE products are manufactured as mixtures of penta-, octa- and decabromodiphenyl ethers, corresponding to the average bromine content (*1*, *2*). In the mid-1990s, the annual world production of flame retardants was 600,000 metric tons. From this total, about 50,000 tons were PBDEs (*3*).

PBDEs are structurally similar to well-known environmental pollutants such as dioxins and PCBs. Due to their relatively low reactivity and high hydrophobicity, they are persistent environmental substances, and for certain congeners, bioaccumulative. The tetra- to hexabrominated congeners exhibit the greatest bioaccumulation and toxicological potentials (*1*, *2*, *4*). Because of the use of these chemicals as flame retardants, they may migrate from the products during their entire life span.

In recent years, PBDE residues have been found in sediments, marine mammals, fish, and bird eggs (*1*, *2*, *5*−*7*). Moreover, PBDEs have also been identified in human blood, adipose tissue, and breast milk (*8*−*12*). There is evidence that, in recent years, PBDE concentrations are rising in human tissues and biota, with a rapid increase (*1*, *4*, *13*). For example, it has been reported that milk from Swedish mothers showed an exponential increase from 1972 to 1997, with a rate of increase that doubled with 5-year increments (*14*).

On the basis of available toxicity data and structural and mechanistic similarities with polychlorinated biphenyls (PCBs), the most sensitive toxic endpoints for PBDEs are probably thyroid hormone disruption and decreases of free thyroxin hormone (T4), neurobehavioral toxicity, and for some congeners, possibly cancer (*1*, *4*, *15*, *16*). However, unlike dioxins and PCBs, PBDEs are not strong inducers of the aryl hydrocarbon hydroxylase receptor (AhR) (*3*).

The environmental fate of PBDEs appears to be analogous to the fate of other structurally similar environmental pollutants such as PCBs, for which the main route of human exposure is via food (*5*). Although sources other than food may also

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Table 1. PBDE Concentrations (ng/kg wet weight) in Food Samples Collected in Catalonia, Spain[a]

food group	vegetables (n=8)[b]	tubers (n=2)	pulses (n=2)	cereals (n=4)	fruits (n=6)	fish and shellfish (n=8)	meat and meat products (n=15)	eggs (n=2)	milk (n=2)	dairy products (n=2)	fats and oils (n=3)
tetraBDE	4.0 (3.9)	0.5 (0)	2.3 (2.0)	2.2 (0)	0.4 (0)	158.3 (158.2)	23.5 (23.3)	17.3 (17.3)	8.0 (8.0)	10.7 (10.7)	169.7 (169.7)
pentaBDE	1.4 (1.3)	0.5 (0)	0.6 (0)	2.2 (0)	0.4 (0)	115.9 (115.8)	24.9 (24.7)	25.8 (25.8)	5.2 (5.2)	23.4 (23.4)	157.7 (157.7)
hexaBDE	0.4 (0)	0.9 (0)	1.1 (0)	4.5 (0)	0.7 (0)	47.4 (47.0)	13.5 (12.8)	11.9 (11.9)	0.5 (0)	2.0 (0)	139.7 (138.0)
heptaBDE	0.7 (0)	1.8 (0)	2.2 (0)	8.9 (0)	1.4 (0)	5.4 (3.0)	23.9 (22.5)	4.4 (3.3)	1.1 (0)	4.0 (0)	77.0 (73.7)
octaBDE	1.4 (0)	3.7 (0)	17.9 (0)	17.9 (0)	2.9 (0)	6.8 (1.4)	23.4 (19.1)	4.7 (0)	2.1 (0)	7.9 (0)	43.7 (30.3)
sum PBDE	**7.9 (5.2)**	**7.4 (0)**	**10.7 (2.0)**	**35.7 (0)**	**5.8 (0)**	**333.9 (325.3)**	**109.2 (102.4)**	**64.5 (58.3)**	**16.9 (13.2)**	**47.9 (34.1)**	**587.7 (569.3)**

[a] For each food group, two values are given. The upper and lower (in parentheses) values were calculated assuming that when a congener was below the detection limit the concentration was equal to one-half of the respective limit of detection (upper value) or zero (lower value). [b] n = number of composite samples analyzed.

influence total PBDE intake in humans, to date, there is an evident lack of data on these hypothetical sources of human exposure. In a recent extensive review of occurrence, dietary exposure, and toxicology of these chemicals, it was concluded that, although sufficient data were available on PBDE levels in fish, less was known about their concentrations in other major food groups or about possible differences in food levels between countries or regions (*5*).

As for most countries, the levels of PBDEs have not been previously investigated in Spain. During 2000−2002, a wide study has been launched in Catalonia (NE Spain) to determine human exposure from dietary sources to several environmental pollutants. Results about metals, dioxins and furans, and PCBs have been recently reported (*17*−*19*). The main objective of the present study was to measure the concentrations of PBDEs in a number of foods acquired in Catalonia and to calculate the dietary intake of these compounds by the population living in this Spanish region.

MATERIALS AND METHODS

Sampling. From June to August 2000, food samples were randomly acquired in local markets, big supermarkets, and grocery stores from seven cities (Barcelona, Tarragona, Lleida, Girona, L'Hospitalet de Llobregat, Badalona, and Terrassa) of Catalonia, which have populations between 150 000 and 1 800 000 inhabitants. For collection of samples, two groups were made up. The first group included meat of beef (steak, hamburger), pork (loin, sausage), chicken (breast), and lamb (steak); fish (hake, sardine) and shellfish (mussel); vegetables and tubers (lettuce, tomato, potato, green beans, cauliflower); fresh fruits (apple, orange, pear), and eggs. The second group included cow milk (whole, semiskimmed) and dairy products (yogurt, cheese); cereals (bread, pasta, rice); pulses (lentils, beans); fats (margarine) and oils (olive, sunflower); tinned fish (tuna, sardine), and meat products (ham, hot dogs, salami). Because, in the first group, most products are usually retailed, their origins could be very diversified in the different cities. Therefore, in that group, 2 composite samples were analyzed for each food item. Each composite was made up of 10 individual samples, which were collected in five different places. In contrast, most food items included in the second group corresponded to brands/trademarks that could be obtained in many different places. Consequently, in this group, only one composite sample was analyzed for each food item. This composite was made up of eight individual samples of similar weights, which were collected in four different places of a same city. The sums of the tetra-to-octabrominated congeners were determined for each sample. A total of 54 samples were analyzed.

Analytical Methods and Instrumentation. Food samples were homogenized and blended using a domestic mixer. Composite samples were lyophilized previously to analyses of PBDEs, which were performed in accordance to the US EPA 1625 method (semivolatile organic compounds by isotope dilution GC/MS). Prior to extraction, dried samples were homogenized. Five to 10 g of the freeze-dried solid samples were mixed with a small amount of Na_2SO_4 and spiked with a mixture of $^{13}C_{12}$-marked standards. Samples were extracted for 24 h with the following organic solvents (Soxhlet-extraction): toluene for vegetables, fruits, cereals, eggs, milk, and dairy products; hexane/dichloromethane (1:1) for meat, fresh fish, and mussels, and petrolether for fish in oil. For oil and margarine, 2 g of the sample was dissolved in hexane and immediately used for the cleanup procedure. The cleanup procedure and fractionation of the sample aliquot was carried out as a multiple cleanup, using adsorption chromatography, a multilayer silica column (from top to bottom: sodium sulfate, silica, silica-sulfuric acid, silica, silica-potassium hydroxide, silica), alumina columns, and gel permeation columns (BioBeads SX3). The final step involved the reduction of the PBDE-containing fractions to the volume necessary for the analysis. Recovery rates were calculated against external reference standards. Standards were used to calculate the amounts of PBDE of their own congener group (e.g., tetra- for tetras, penta- for pentas, etc.), with the exception of OctaBDE that was calculated using $^{13}C_{12}$-HeptaBDE #183. The cleaned extract was analyzed by high-resolution gas chromatography/high-resolution mass spectrometry (Fisons CE 800 gas chromatograph coupled with a VG Autospec Ultima system with electronic impact and a multiple ion detection mode (with a resolution of >10 000)). A DB-XLB column (60 m, 0.32 mm i.d., 0.25μm dF) was used. The following internal standards were used to quantify PBDEs.: $^{13}C_{12}$-TetraBDPE #47, $^{13}C_{12}$-PentaBDPE #99, $^{13}C_{12}$-HexaBDPE #153, $^{13}C_{12}$-HexaBDPE #154, $^{13}C_{12}$-HeptaBDPE #183. One ng of each standard was used. Mean recovery rates ranged from 79%, for the sum of pentaBDEs (range 55−106%) and hexaBDEs (range 54−115%), to 85% (54−114%) for the sum of heptaBDEs. The detection limits varied from 5 to 40 ng/kg dry weight, depending on the specific food and the respective congeners.

Dietary Exposure Estimates. Average daily consumption data were obtained from recent studies carried out in Catalonia (*20*, *21*). PBDE intake was estimated for each food group assuming that when a congener was below the detection limit, the concentration was either equal to zero (not detected (ND) = 0) or one-half of the respective limit of detection (LOD) (ND= $^1/_2$ LOD). Results are presented for both assumptions.

RESULTS AND DISCUSSION

The concentrations of PBDEs in foodstuffs acquired in various locations of Catalonia in 2000 are given in **Table 1**. Results (wet weight) show the sum levels of tetra-, penta-, hexa-, hepta-, and octaBDEs, as well as the sum concentrations of total PBDEs (tetra to octa). Data are presented for 11 food groups. Calculations assuming that ND = $^1/_2$ LOD and ND = 0 are given for each food group. The highest concentration of total PBDEs was found in oils and fats (587.7−569.3 ng/kg), followed by fish and shellfish (333.9−325.3 ng/kg), meat and meat products (109.2−102.4 ng/kg), and eggs (64.5−58.3 ng/kg). In all these groups, a predominance of the homologues tetra- and pentaBDEs, followed by hexaBDEs, was observed in the sum of total PBDEs. By contrast, PBDEs were not detected in the groups of fruits, cereals, and tubers (**Table 1**). On the other

Table 2. PBDE Concentrations in a Number of Food Samples Collected in Catalonia, Spain[a]

food	ng/kg lipid weight	ng/kg wet weight
vegetables		8 (5)
tubers		7 (0)
pulses		11 (2)
cereals		36 (0)
fruits		6 (0)
white fish	2359 (2052)	88 (37)
shellfish	3140 (2961)	88 (83)
tinned fish	2117 (1997)	260 (246)
blue fish	10839 (10804)	1019 (1016)
pork and pork products	597 (565)	172 (166)
chicken	247 (0)	10 (0)
beef and beef products	290 (248)	42 (36)
lamb	261 (182)	31 (21)
eggs	530 (482)	64 (58)
dairy products	677 (557)	48 (34)
whole milk	630 (525)	24 (20)
semiskimmed milk	618 (402)	10 (6)
vegetable oils and fats	805 (795)	804 (794)
margarine	188 (145)	155 (120)

[a] Data were calculated assuming that when a congener was below the detection limit, the concentration was equal to one-half of the respective limit of detection. Values in parentheses were calculated assuming that ND = 0.

hand, the concentrations of PBDEs in a number of food groups are also presented (**Table 2**). Data are given in ng/kg lipid weight and ng/kg wet weight. In both cases, blue fish showed the highest levels, followed by the remaining fish and shellfish items (lipid weight basis) or by oils and fats (wet weight basis). In recent years, a number of investigators have determined PBDE levels in various marine and freshwater species. However, data on PBDE concentrations in other major food groups are very scarce. In a recent review, Darnerud et al. (*5*) reported PBDE levels between 26 and 36 900 μg/kg lipid in various fish species from Swedish lakes and rivers. In the same review, the mean PBDE level in mixed meat products and eggs from Sweden was reported to be between 360 and 420 ng/kg fat.

In a study carried out in freshwater fish from selected locations in Washington state, total PBDE concentrations ranged from 1.4 μg/kg (wet weight) in rainbow trout from a remote spring-fed stream to 1250 μg/kg (wet weight) in mountain whitefish from an urbanized river (*22*). On the other hand, in nine fish species collected from the Inland Sea of Seto (Japan), the concentrations of total PBDEs varied between 110 and 3 300 ng/kg (wet weight) (*23*), a range in which our current results in fish and shellfish are included. In marine fish and blue mussels from southern Greenland, Christensen et al. (*24*) found a total PBDE concentration in fish between 1800 and 12 000 ng/kg (wet weight), depending on location and species, while for mussels, the concentration was 110 ng/kg (wet weight).

Recently, Otha et al. (*25*) determined the concentrations of PBDEs in fish, meat, and vegetables and tubers sold in food markets from Hirakata (Japan). Total PBDE levels in fish tissues ranged from 17.7 to 1720 ng/kg (wet weight). Again, the results of the present study are within this range. The concentrations of PBDEs in vegetables and tubers detected by Otha et al. (*25*) were between 38.4 and 134.0 ng/kg (wet weight), values higher than the current results. Finally, PBDE concentrations in meat varied from 6.25 to 63.6 ng/kg (wet weight) for chicken and pork, respectively (*25*). In contrast to the levels found in vegetables and tubers, our current concentrations in meat are higher.

Table 3 shows data on food intake and dietary intake of PBDEs for a standard male adult of 70-kg body weight. Total

Table 3. Estimated Dietary Intake of PBDEs by the Adult Population of Catalonia, Spain[a]

food group	daily consumption[b] (g)	PBDE intake[c] (ng/day)
vegetables	226 (15.7)	1.8 (1.2)
pulses	24 (1.7)	0.3 (0.05)
cereals	206 (14.3)	7.4 (–)
tubers	74 (5.1)	0.6 (–)
fruits	239 (16.6)	1.4 (–)
fish and shellfish	92 (6.4)	30.7 (29.9)
meat and meat products	185 (12.8)	20.2 (18.9)
eggs	34 (2.4)	2.2 (2.0)
dairy products	106 (7.3)	5.1 (3.6)
milk	217 (15.0)	3.7 (2.9)
fats and oils	41 (2.8)	24.1 (23.3)
total intake	1444 (100)	**97.3 (81.9)**
		1.4 (1.2)[d]

[a] Results are given for a male adult of 70-kg body weight. [b] In parentheses, percentages of total consumption. [c] Data were calculated assuming that when a congener was below the detection limit, the concentration was equal to one-half of the respective limit of detection. Values in parentheses, were calculated assuming that ND = 0. [d] Total intake expressed in ng/kg body weight/day.

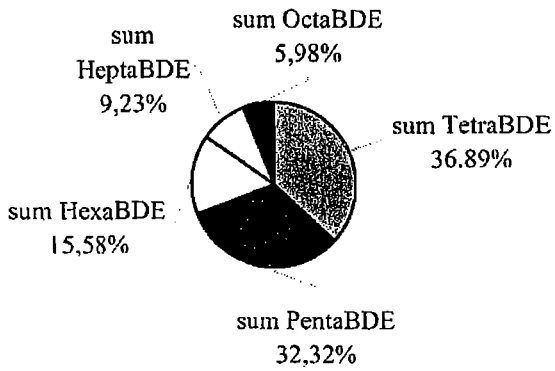

Figure 1. Percentages of contribution of the different congeners to the total dietary intake of PBDEs (ng/day). Calculations assuming ND = 0.

dietary intake was between 97.3 ng/day (ND = $^1/_2$ LOD) and 81.9 ng/day (ND = 0), or between 1.4 and 1.2, when the results are expressed in ng/kg body weight/day. The highest contribution to this intake corresponded to fish and shellfish, with approximately one-third of the total intake, followed by oils and fats and meat and meat products, with a contribution of about one-fourth each. In contrast, the lowest percentages corresponded to vegetables and tubers, fruits, and cereals. Although the dietary consumption of these foodstuffs in Catalonia is very notable, the low fat content of these products, and consequently their comparatively low PBDE content, explain the small contribution of these food groups to the total dietary intake of PBDEs.

The percentages of contribution of each PBDE homologue group to the total dietary intake of these pollutants are depicted in **Figure 1**. The highest contribution to total PBDE intake corresponded to tetraBDEs and pentaBDEs, with approximately one-third each. On the other hand, the estimated PBDE intake (ng/kg body weight/day) for the population of Catalonia, according to sex and age, is shown in **Figure 2**. Total PBDE intake through the diet ranged from 2.6 for boys under 9 years old to 0.9 for males in the group >65 years. For both sexes, the dietary intake of PBDEs was relatively constant from 10 to 65 years.

Information on PBDE dietary intake is very scarce. Searching in the scientific literature, we have only found four studies. A

Table 4. A Summary of Data of Human Exposure to PBDEs through the Diet

country	characteristics of the study	PBDE intake (ng/day)	remarks	reference
Sweden	market basket samples: fish, meat, dairy products, eggs, fats/oils,pastry	51 sum of congeners 47, 99, 100, 153, 154	calculations for intake were done assuming that ND = 1/2 LOD	Darnerud et al. 2001 (5)
Sweden	foods of animal origin, Diet National Swedish inventory	females (18–74 years) mean: 40.8 sum of congeners 47, 99, 100, 153, 154	calculations for intake were done assuming that ND = 0	Lind et al. 2002 (26)
Canada	food basket study, most food samples of animal origin	44		Ryan and Patry 2001 (27)
UK	duplicate diet samples	median: 90.5 sum of congeners 47, 99, 100, 153, 154	calculations for intake were done assuming that ND = 0	Wijsekera et al. 2002 (28)
Catalonia (Spain)	total diet study, 54 samples belonging to 11 food groups	81.9 (lower) 97.3 (upper) sum of tetra- to octaBDEs	ND = 0 ND = LOD	this study

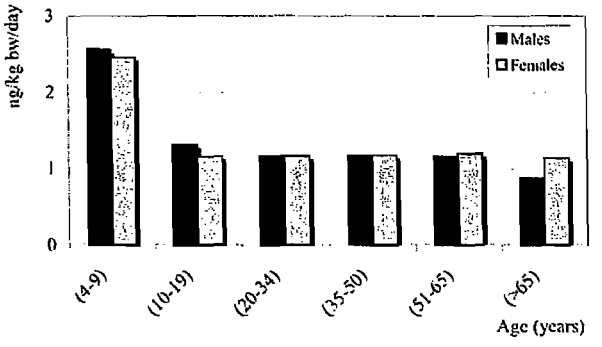

Figure 2. Estimated dietary intake of PBDEs by the general population of Catalonia, Spain, in relation to age and sex. Caculations assuming ND = 0.

summary of results of these studies, together with those of the current survey, are shown in **Table 4**. In an estimation of PBDE exposure from food in Sweden, the dietary intake was 51 ng/day (calculations were done assuming that ND = 1/2 LOD). This intake was higher than that found in a subsequent study, in which only food of animal origin was included (*26*). Total dietary intake for Swedish females (18–74 years old) was 40.8 ng/day. However, in that case, when the concentration of a PBDE congener was below the detection limit, that concentration was assumed to be zero (ND = 0) (*26*). It is important to remark that, in both Swedish studies, only PBDE congeners 47, 99, 100, 153, and 154 were determined. A similar dietary intake, 44 ng/day, was also found for Canadian adults in a food basket study (*27*). About 75% of the daily intake of PBDEs corresponded to meat, while dairy products and fish contributed with approximately 7 and 4%, respectively. Finally, in a recent survey carried out in the United Kingdom, the median dietary intake of PBDE congeners 47, 99, 100, 153 and 154 was 90.5 ng/day (calculations were done assuming that ND = 0) (*28*). This intake is very similar to our current estimated lower intake, 81.9 ng/day.

Although in human tissues and fluids PBDE levels are still lower than those of other environmental contaminants such as PCBs, recent data suggest an increasing trend in human PBDE concentrations over time (*5*, *13*, *14*). Therefore, it is important to establish which are the human health risks derived from the intake of PBDEs through the diet. The following estimations were made for evaluation of PBDE risks in Catalonia. On the basis of the most sensitive endpoints for toxic effects of PBDEs, a lowest observed adverse effect level (LOAEL) value of 1 mg/kg/day was recently suggested as reasonable for compounds or mixtures belonging to the PBDE group (*5*). The comparison of the current dietary intake (1.4–1.2 ng/kg body weight/day) with the suggested LOAEL value of 1 mg/kg/day results in a safety factor over 5 orders of magnitude in relation to PBDE exposure from food. However, in a recent study, Wijesekera et al. (*28*) showed that, in an overall daily exposure to PBDEs, diet and inhalation contributed with 73 and 27%, respectively. This indicates that in addition to special dietary habits, the safety factor can be also notably influenced by other types of PBDE exposure. Taking into account the scarce information on the above, further investigations are clearly necessary.

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Killam
Associates □ Consulting Engineers

City of Newark
Essex County, New Jersey

New Jersey Pollutant Discharge Elimination System General Permit No. NJ0105023 for Combined Sewer Systems

Sewer System Inventory and Assessment Report

February, 1996

KLL001202

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ction 1

1.0 INTRODUCTION

The City of Newark operates a combined sewer system which is permitted under NJPDES Permit No. NJ0105023. As a requirement of the permit, the City of Newark must prepare and submit to NJDEP a Sewer System Inventory and Assessment Report (Inventory and Assessment Report). This report provides an inventory and engineering assessment of the operational status and mechanical and structural integrity of the major components of the combined sewer system.

A total of 30 overflows within the Newark system are listed in the City's general permit. The ***Key Map*** which is included at the end of this report indicates the location of the 30 permitted overflows. There is a somewhat unusual arrangement regarding the operation of these overflows. The majority of the regulators are either owned or under the operational control of the Passaic Valley Sewerage Commission (PVSC). The remaining overflows are operated by the City. The City's general CSO permit also includes the overflow between the regulator and the receiving water even when the regulator is either owned or operated by PVSC. The overflows covered by the City's permit are listed in ***Table 1 - Overflows Included in General CSO Permit.*** The regulators which are either owned or operated by PVSC are also identified. Of the 30 overflows identified in the City's general permit, four (4) of the overflows (Nos. 019, 020, 021 and 028) are permitted storm drains. However, these storm drains reportedly contain illegal wastewater or industrial connections. Two other overflows (Nos. 001 and 006) are relief and storm overflows with wastewater connections reportedly from other jurisdictions. The City intends to further investigate the sources of the wastewater and industrial connections to these six (6) permitted overflows in order to have them reclassified and eliminated from its CSO permit. However, until the reclassification process has been completed, these overflows continue to be part of the City's CSO program.

The overflows which are either owned or operated by PVSC have been evaluated by and are being submitted under separate cover by PVSC to satisfy the permit requirements for both PVSC and the City of Newark.

KLLC01204

Table 1 - Overflows Included in General CSO Permit

CSO No.	Designation	Receiving Water	PVSC Owned or Controlled Regulator	City Owned or Controlled Regulator	Outfall Type
001	Meadowbrook	Second River		Yes	Relief CSO
002	Verona Avenue	Passaic River	Yes		Primary
003	Delavan Avenue	Passaic River	Yes		Primary
004	Herbert Place	Passaic River	Yes		Primary
005	Herbert Place	Passaic River	Yes		Primary
006	Oriental Avenue	Passaic River		Yes	Relief CSO
007	Third Avenue	Passaic River	Yes		Primary
008	Fourth Avenue	Passaic River	Yes		Primary
009	Clay Street	Passaic River	Yes		Primary
010	Clay Street	Passaic River	Yes		Primary
011	Orange Street	Passaic River	Yes		Primary
012	Bridge Street	Passaic River	Yes		Primary
013	Rector Street	Passaic River	Yes		Primary
014	Saybrook Place	Passaic River	Yes		Primary
015	City Dock	Passaic River	Yes		Primary
016	Jackson Street	Passaic River	Yes		Primary
017	Polk Street	Passaic River	Yes		Primary
018	Freeman Street	Passaic River	Yes		Primary
019	Brown Street	Passaic River		Yes	Permitted Storm Outfall
020	Lockwood Street	Passaic River		Yes	Permitted Storm Outfall
021	Blanchard Street	Passaic River		Yes	Permitted Storm Outfall
022	Roanoke Avenue	Passaic River		Yes	Primary
023	Adams Street	Peripheral Ditch		Yes	Primary
024	Wheeler	Peripheral Ditch		Yes	Primary
025	Peddie Street	Peripheral Ditch	Yes		Primary
026	Queen	Peripheral Ditch	Yes		Primary
027	Waverly	Peripheral Ditch	Yes		Primary
028	Haynes Avenue	Peripheral Ditch		Yes	Permitted Storm Outfall
029	Waverly	Peripheral Ditch	Yes		Primary
030	Avenue A	Peripheral Ditch		Yes	Primary

KLL001205

Section 2

2.0 INVENTORY AND ASSESSMENT REPORT

The City arranged to have the various overflows inspected by a private firm, A-Tech from Vineland, NJ. The appendix of this report includes the unedited A-Tech summary sheets for each outfall. The City intends to conduct further investigations of the overflows which are operated by the City. These future evaluations will be maintained by the City in its Facilities Inventory and Assessment Analysis (FIAA) and will ultimately be included the Combined Sewer Overflow Pollution Prevention Plan (CSOPPP).

KLLC01207

Appendix - A

CSO Inspection Survey

KLLC01209

SUPPLEMENTAL SURVEY INSTRUCTIONS AND OVERFLOW SITE DETAILS IN NEWARK

As a supplement to our instructions of March 27, 1992, we are transmitting on Pages 1 - 7 herein, additional instructions regarding the required field survey and inspection work associated with the City of Newark CSO study. Much of the inspection work will involve the videotaping and narration of the sewer structures and above ground sites. Following the supplemental instructions, Pages 8 - 30 provide detailed descriptions of each of the overflow sites to be surveyed.

Supplemental Instructions for Videotaping: Do not try to economize on tape. At least ten to 15 minutes per overflow site should be taped. Time, date, weather, tide level and flow should be described in narrative at start of each taping. Street location and access routes should be narrated. Tape should be thoroughly narrated, describing exactly what is being photographed and in what direction the camera is facing. Above ground shots over the structures should pan 360 degrees. Impressions such as odors, traffic problems, access problems, nearby houses, businesses, traffic, and bystanders, crime menace, cleanliness of the site should be included in the narrative as appropriate.

Subsurface shots should be thoroughly narrated as to what is being looked at. Be specific in narrative and note directions, north, south, inlet pipe, outlet pipe, etc. Narrate flow conditions observed, i.e. fast, clear sluggish, turbulent, viscous, foaming, splashing, flow depths, etc.

Supplemental Instructions for Regulated Overflow Site Surveys. A minimum of 19 standard regulated overflow sites require inspection. These include:

002	Verona Ave	003	Delavan Ave	004-005	Herbert St
007	Third Ave	008	Fourth Ave	009b	Passaic St
009-010	Clay St	011	Orange St	012	Bridge St
013	Rector St	014	Saybrook Pl	015	City Dock
016	Jackson St	017	Polk St	018	Freeman St
022	Roanoke Ave	025	Peddie St	026	Queen St
027	Waverly				

KLL001210

The Passaic regulators, 002-018, and maintain three others, 25-27. The PVSC will need to be contacted before the subsurface structures at these sites are inspected, and may want to be present during the inspection. Your staff will coordinate their inspections with the PVSC and any Newark Personnel who select to be present. The City operates regulator 022 and all internal overflows.

These regulated overflows include some or all of the following seven elements:

A	a diversion structure	B	a sandcatcher
C	a regulator	D	a dry weather sanitary connection
E	tide gate chambers	F	a wet weather outfall
G	a headwall outfall structure		

In some locations the several of these elements are combined in a single structure. The above ground and internal features at each of the seven structures shall be videotaped and narrated. Inspection and videotaping of the diversion structure, tide gates, outfall sewer, and outfall structure are of primary importance. Inspection and videotaping of sandcatchers on the dry weather branch, the regulator and the sanitary connection are of equal importance. The inspection and videotape work to be performed at each standard regulator site is summarized hereinafter, with special considerations noted in the text describing each regulator included herewith:

A. A diversion structure including (1) one or more inlet pipes, (2) a weir or dam and (3) two outlets, a dry weather and wet weather overflow.

Indicate type, height and condition of weir or dam. If sizes of inlets and outlets appear to differ from those indicated provide correct sizes. Verify width of structure at stop logs. Note external and internal access conditions. Note levels of surcharge.

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B. A sandcatcher structure either on the dry weather outlet pipe downstream of the diversion structure or as a part of the diversion structure.

If dimensions appear to differ from those given provide correct dimensions. Note the access conditions of the sandcatcher.

C. A regulator on the dry weather pipe downstream of the sandcatcher, generally with two compartments, one chamber housing the control and sensing equipment (float or electronic sensor), and the other with the flow channel and flow channel gate.

In the 1980's PVSC renovated the following ten regulators:

002	Verona	004-5	Herbert	008	Fourth
009-10	Clay	013	Rector	014	Saybrook
015	City Dock	016	Jackson	017	Polk
018	Freeman				

The renovation included the installation of new metal tide gates, a remote operated regulator sluice gate (open and shut by a telemetered signal from the PVSC Plant) and float removals. In some locations, ultra-sonic level sensors were added, however these control sensors are not operational.

If the regulator is not operating as indicated in the attached site descriptions, indicate what type of control appears to be presently operational, if any. Verify that the layout of on chambers indicated on drawings is still valid. Provide sizes of orifice and gates if different from those shown and noted in site descriptions. Note provisions for manual control.

D. A connection to the Intercepting Sewer downstream of the regulator.

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Open Interceptor manhole to confirm type of connection including drop, etc.

E. **Tide gate chambers** with one or two tide gates on the storm overflow sewer downstream of the diversion structure.

Check size and operability of each tide gate, comment on structural condition of each gate, snugness of frame seat, submergence, leakage, sedimentation, provisions for manual operation and for removal.

F. The **outfall pipe** connecting the tide gate chambers and the outfall structure. This pipe is often partly or fully submerged depending on tidal level. Attempt to inspect during low tide.

Field locate all intervening manholes and note their condition. Open the manhole covers and examine manhole conditions from the surface and videotape salient features. Along the ground above the outfall thoroughly videotape in both directions a swath 50 feet on each side of the outfall. This is especially important because any proposed facilities may be located therein. Note all barriers.

G. The **outfall structure** or **headwall** at the edge of the overflow receiving waterway.

Obtain tide tables. Inspect during low tide. Note structural condition, siltation of invert, any protection to prevent access, access conditions including barriers to access, condition of waterway (shallow, deep, debris, floatables, turbulent, stagnant, etc), condition and use of shore line for 50 feet on either side of access structure, any boating or docking facilities nearby. Some outfalls may only be accessible by boat.

KLL001213

Supplemental Instructions Regarding Sealed Overflows. There are three former regulators in which the wet weather overflow is believed to be sealed. These are: (1) 009a. Clark Street, (2) 009c. Route 21 and, 019. Brown Street. Check that the wet weather outfall is closed on these overflows.

Supplemental Instructions at Non-Regulated Overflows. At least twelve overflow sites are not regulated by standard regulators. Seven are (A) storm outfalls that accept combined sewage overflow from surcharged combined sewers through internal relief overflows. Five are (B) possibly misused separate storm sewers:

A. Internal relief overflows that allow an upstream surcharged combined sewer to overflow into an adjacent storm drain that is not intercepted, or a less surcharged adjacent combined sewer. Your staff will inspect the following internal overflows:

001. The Meadowbrook Outlet and the internal tributary overflow at 13th Street and Sixth Avenue.

002a The purported overflow at Grafton and McCarter.

003 The overflows at Summer and Elwood Avenues (or at Heller Parkway) and at Delavan Avenue and Erie Place.

006 The overflow at Broadway and Second Avenue.

023 The internal overflows along the South Street Interceptor, including those at Dawson Street and at Adams Street.

029 The Busch diversion manhole.

030 The internal overflows along the Emmet Street internal interceptor including the regulator at Emmet Street and McCarter Highway.

KLL001214

In these locations your staff will provide a videotaped detailed description of the diversion structure including the overflow weir or pipe configuration, noting any differences from the provided drawings. An above ground videotaped description of the route of the outfall drain is needed, as well as a description of the storm drain outfall to the waterway. Your staff should note the quality of any dry weather discharges in the outfalls and open upstream manholes to trace the sources.

B. Possibly misused separate storm drains that have been used to discharge polluting industrial or commercial wastes often from surface sources. Permitted outfalls of this description include the following:

019	Brown St	020	Lockwood St	021	Blanchard St
024	Wheeler	028	Haynes		

In the storm drains tributary to 019, 020 and 021, a 1979 CBA report indicated a number of polluting discharges into specific manholes along the drain. Your staff will reinspect these manhole to determine if these discharges remain active. Your staff wil also attempt to trace the source of any other observed dry weather flow. Provide a videotaped above ground description of the route of the outfall drain, as well as a description of the storm drain outfall to the Passaic River.

At the Wheeler outfall 024 your staff will verify (1) that outfall under the railroad is not interconnected with 030, (2) that the outfall only intercepts railroad ditches, (3) and the inflow from the railroad ditches is unpolluted. Your staff will attempt to trace the source of any other observed dry weather flow. Provide a videotaped above ground description of the route of the outfall drain, as well as a description of the storm drain outfall to the Wheeler Ditch.

KLL001215

At the Haynes outfall 028, your staff should open manholes to determine whether the northward flowing sewer in the west side of Route 1 north of Haynes road, (1) contains sanitary sewage and (2) is intercepted before discharge. Videotape the outfall which may be under bridge or in culvert under roadway.

KLL001216

Detailed Descriptions of Overflow Sites

Overflow 001 is apparently a non-regulated relief overflow that discharges into a large relief storm sewer that is not intercepted by PVSC sewers.

001. Meadow Brook. This outfall discharges into Second River at the Belleville boundary. This 156-inch outfall of a relief storm sewer also serves to relieve surcharging in a 46x69 combined sewer at Sixth Avenue and Thirteenth Street. This internal overflow noted in 1976 CSO Study, is about 12,000 feet south the outfall in an area tributary to Regulator 009-010. Details of the upstream diversion and any other sanitary interconnections need to be ascertained from the City. Relief sewer plans need to be obtained from the outfall to the point of diversion.

Dry weather flows from Overflows 002 through 015 are diverted to the adjacent PVSC Main Intercepting Sewer.

002. Verona Ave. This is a standard PVSC style regulated overflow. The combined influent sewer is 56-inch. The diversion chamber is on the west side of Riverside Avenue. Dry-weather flow is diverted by a concrete dam through a 30x60-inch semicircular conduit into a sandcatcher and regulator that discharges into the PVSC Main Intercepting Sewer all on the west side of Riverside Avenue. Prior reports do not supply details of the regulator chamber. The regulator was renovated by PVSC in the early 1980's. The PVSC renovation included a remote operated regulator sluice gate (open and shut by a telemetered signal from the PVSC Plant) and float removals. Ultrasonic level sensors may have been installed, however these control sensors are not operational.

KLL001217

Wet-weather excess flow overtop the dam and discharges into 72x55-inch horseshoe outfall and passes through a tide gate chamber on the east side of Riverside Avenue housing two 54x72-inch tide gates. The PVSC renovation included the installation of new metal tide gates. The outfall continues 335 feet eastward to the Passaic River. The outfall is above the water level at low tide.

The 1983 PVSC CSO Facility Plan indicated that off line storage was a feasible option at this overflow site. A 1992 Review indicated that the outfall appeared unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

002a. Grafton Street at McCarter Highway. A Newark internal relief overflow is noted at Grafton Street and McCarter Highway. The route of the overflow and the flow diverted should be determined. Determine height of diversion dam above invert, determine inspect, and report on storm outfall downstream of diversion.

003. Delavan Avenue. This site is the combination of a non-functioning PVSC Regulator and two relief overflows. The PVSC Delavan Avenue Regulator at Delavan and Riverside Avenues routes the intercepted sanitary flow in 10-and-12-inch interceptor from 88 acres through a 12-inch pipe into the non-operating regulator. At the regulated diversion chamber, wet weather discharge would top a 5-foot high brick wall with 6-inch slit above tidal range provided for overflow. No overflow was observed by Killam, because excess combined flow is diverted to a parallel 54-inch storm drain at two upstream locations: (1) Delavan Avenue at Erie RR and (2) Summer Avenue at Elwood St. The relief diversion structures at these sites require details and inspection. The flows in the 54-inch sewer is not intercepted but discharges 165 feet to the west through the Permitted 60-inch 003 outlet to the Passaic River. The outfall is above the water level at low tide. A 1992 Review indicated that due to the proximity of boat docking facilities,

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the outfall appeared unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

004-005. Herbert Place. This is a standard PVSC regulated overflow type. The diversion chamber and sandcatcher on the 51-inch inlet sewer are in a common structure at the east end of Herbert Place on the west side of McCarter Highway. Stop logs divert dry weather flow to a gated 12x36-inch side outlet into an adjacent two-chamber, float operated regulator with manual operation override. Determine the method of manual override. The regulator was renovated by PVSC in the early 1980's. The PVSC renovation included, a remote operated regulator sluice gate (open and shut by a telemetered signal from the PVSC Plant) and float removals. Ultrasonic level sensors may have been installed, however these control sensors are not operational. Flow from the regulator discharges into a short length of 24-inch connecting sewer directly tributary to the adjacent PVSC Main Intercepting Sewer.

Wet weather excess flow overtops the stop logs into a 42-inch sewer under McCarter Highway. Because the diversion dam elevation is above the tidal range, there are no tide gates. On east side of McCarter Highway, the outlet splits into two adjacent parallel outfall pipes which extend 400 feet to the Passaic River. Outlet 004 to the north is 51-inch. Outlet 005 to the south is a 72x48-inch horseshoe. The outfall is partially submerged at low tide with easy access.

The 1983 PVSC CSO Facility Plan indicated that both off line storage and coarse screening were feasible treatment options at this overflow site. A 1992 Review indicated the joint outfall appeared suitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

KLL001219

006. Oriental Street. The 48x48-inch discharge north of Oriental Street appears to relieve an upstream surcharged 48x36-inch combined sewer at Broadway and Second Avenue that is tributary to downstream overflow 008. The downstream portions of this sewer also collects drainage. Details of the diversion and the 54-and 48-inch storm sewer in Oriental Street between Broadway and the Passaic River outfall, along with headwall . details are required. A 1992 Review indicated the outfall was concealed by a barge and that debris clogged the vicinity of the outfall. The outfall appeared unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

007. Third Avenue. This is a standard PVSC regulated overflow type. The diversion chamber and sand catcher are on a 15-inch inlet in a common structure east of Passaic Street and Third Avenue. Open the few manholes on Oriental Street east of McCarter Highway to determine whether cross connection exist between the inlet sewer and 006 outfall pipe in Oriental Street. Stop logs divert dry weather flow into an adjacent two-chamber regulator through a gated 10x20-inch side outlet and an inoperable float-operated gate. The regulator flow discharges to the PVSC Main Intercepting Sewer, via an 18-inch connection to a 36-inch branch intercepting sewer that also collects the dry weather flow from Regulator 008 at Fourth Street. According to 1978 CSO Study, there is no indication that overflow has occurred at this site due to the small tributary area and the large dry weather connection pipe.

Wet weather overflow, if ever occurring would discharge through two 18-inch tide gates in manholes immediately downstream, then 150 feet to the Passaic River in a 15-inch outfall. A 1992 Review indicated the outfall may be submerged at low tide. An eroding shoreline and debris in the vicinity of the outfall make this outfall appear unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

KLL001220

008. Fourth Avenue. This is a standard PVSC regulated overflow type. The Diversion chamber and sand catcher on 48x33-inch inlet in common structure in Fourth Avenue, east of Passaic Street. Part of the tributary flow is diverted upstream to Overflow 006. Stop logs divert dry weather flow through a side 24-inch outlet and gated 12x36-inch orifice into an adjacent two-chamber, previously float operated regulator with manual operation override.

The regulator was renovated by PVSC in the early 1980's. The PVSC renovation included a remote operated regulator sluice gate (open and shut by a telemetered signal from the PVSC Plant) and float removals. Ultrasonic level sensors may have been installed, however these control sensors are not operational. The regulated dry weather discharge to PVSC Main Intercepting Sewer, is through a 700-foot 24x36-inch branch intercepting sewer in Passaic Street that also collects the dry weather flow from Regulator 007 at downstream Third Avenue.

Excess wet weather flow overtops the stop logs and pass through two 48x36-inch tide gate in a downstream portion of the monolithic structure. The PVSC renovation included the installation of new metal tide gates. Discharge to the Passaic River, 250 feet to the east is through a 48x48-inch, rounded-square outfall sewer. The outfall is reportedly submerged at low tide, and surrounded by concrete debris.

The 1983 PVSC CSO Facility Plan indicated that off line storage was a feasible option at this overflow site. A 1992 Review indicated the outfall appeared unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

KLL001221

009a. Clark Street. This un-Permitted overflow has a standard PVSC regulator arrangement. The diversion chamber-sandcatcher on the east side of Passaic Avenue at Clark Street diverts dry weather flow from a 24x36-inch inlet and a side 12-inch inlet through a float operated regulator gate, to an 18-inch sewer in Passaic Street. This sewer is twice regulated downstream once at Passaic Street 009b at Carlisle Street and again at Clay Street 009-010 at McCarter Highway. The wet weather outfall to the Passaic River through the 24x36-inch outfall is reported by Killam to have been blocked off. This explains the lack of a permit. Video inspect this regulator to determine if it has an active wet weather outlet different from the dry weather outfall. Are there upstream relief overflows?

009b. Passaic Street. This regulated overflow has a standard PVSC regulator arrangement. The diversion chamber sand trap are in a common structure on Passaic Street north of Carlisle Street diverting the 18-inch inlet, which includes dry-weather flow from 009a, diverts dry weather flow through a possibly inoperable float-operated, 10x20-inch, regulator gate, to an 18-inch interceptor in Carlisle Street. This interceptor is re-regulated downstream at Clay Street 009-010 at McCarter Highway.

The wet weather overflow discharges through two 18-inch tide gates and a short 18-inch sewer that discharges into the 11-foot wide outfall 009 from the Clay Street Regulator that extends to the Passaic River 210 feet to the east.

009c Route 21. Early plans indicated a regulator on the Route 21 sewer entering the Clay Street regulating facilities from the north. Videotape this regulator and determine if it has an open wet weather outlet different from the dry weather outfall.

KLL001222

009-010. Clay Street. This is the largest overflow to the Passaic River from Newark. This regulated overflow has a standard PVSC regulator arrangement. The diversion chamber was constructed on the twin 111x81-inch semi-elliptical inlet pipes on the west side of Route 21 at Clay Street. Upstream about 1.5 miles to the west, the tributary system is relieved at Sixth Avenue and 13th Street, see Overflow 001. Dry weather Clay Street flow is diverted to the sandcatcher through twin 30x66-inch conduits. These conduits have stem operated, manual control sluice gates on their outlets.

From the sandcatcher, the flow passes through a formerly float regulated 24x72-inch orifice gate into the very deep channel of the regulator. The regulator was renovated by PVSC in the early 1980's. The PVSC renovation included a remote operated regulator sluice gate (open and shut by a telemetered signal from the PVSC Plant) and float removals. Ultrasonic level sensors may have been installed, however these control sensors are not operational. Flow from four local interceptors including the regulated Passaic Street and the possibly regulated Route 21 sewer enter the regulator chamber. Flow from the deep regulator enters the adjacent 54-inch, PVSC Main Intercepting Sewer, through a 54-inch side connection.

Wet weather flow passes over a concrete diversion dam with stop logs into three parallel 70-inch wide channels, each equipped with two 66-inch high tide gates. The PVSC renovation included the installation of new metal tide gates. Downstream of the tide gates, the flow converges into twin 81x111-inch outfalls that continue 600 feet to the east to the Passaic River. The northern barrel is designated 009 while the southern barrel is designated 010. Wet weather flow from the Passaic Street regulator enters 009 about 250 feet west of the Passaic River. The outfall is partially submerged at low tide with under bridge access.

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The 1983 PVSC CSO Facility Plan indicated that both two off line storage tanks and coarse screening were feasible options at this overflow site. A 1992 Review indicated the outfall appeared suitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

011. **Orange Street.** This is a standard PVSC regulated overflow type. The combined diversion chamber-sandcatcher is at the outlet junction of a 18-inch combined, 15-inch combined, and two 8-inch storm sewers in a common structure on the east side of McCarter Highway at Orange Street. Stop logs divert dry weather flow through a side outlet and a reportedly inoperable float-operated 10x20-inch gate into the adjacent two-chamber regulator. A sluice gate on the inlet of the orifice provides manual control. The regulator flow discharges to the PVSC Main Intercepting Sewer through an adjacent 18-inch pipe and drop manhole.

Excess wet weather flow, overflows the stop logs and enters the 100-foot, 24x24-inch outfall to the Passaic River. Because the stop log elevation is above the tidal range, there are no tide gates on the outfall. A 1992 Report indicated that due to an eroded shore line, on-shore debris, and lack of convenient access, the outfall appeared unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

012. **Bridge Street.** This is a standard PVSC regulated overflow type. The combined diversion chamber, sandcatcher is on the 15-inch sewer in the south side of Bridge Street about 50 feet west of the Passaic River. Stop logs divert dry weather flow through a manually operated side gate and 15-inch sewer that discharges into a two-chamber regulator on the north side of Bridge Street. A reportedly inoperable float-operated 10x20-inch regulator gate was designed to control the rate of flow. The regulator flow discharges to the PVSC Main Intercepting Sewer in Route 21, through a 150-foot, 18-inch pipe and an adjacent drop manhole.

KLL001224

Excess wet weather flow, overtops the stop logs in the diversion chamber and enters the 50-foot, 15-inch outfall to the Passaic River. Because the stop log elevation is above the tidal range, there are no tide gates on the outfall. A 1992 report indicated that the accessible, square outfall, partially submerged at low tide appeared suitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

013 Rector Street. This is a standard PVSC regulated overflow type. The diversion chamber-sandcatcher in a common structure intercepts a 54x60-inch combined sewer on the east side of McCarter Highway at the Saybrook Place ramp south of Rector Street. A 48-inch sewer interconnects this chamber with the inlet of the Saybrook Place regulator 014 about 300 feet to the south. Stop logs divert dry-weather flow into the regulator through a side outlet with a formerly float operated 12x36-inch regulator gate.

The regulator was renovated by PVSC in the early 1980's. The PVSC renovation included a remote operated regulator sluice gate (open and shut by a telemetered signal from the PVSC Plant) and float removals. Ultrasonic level sensors may have been installed, however these control sensors are not operational. The regulator flow discharges to the PVSC Main Intercepting Sewer through a 24x42-inch intercepting sewer that flows 300 feet southward and also intercepts Regulator 014.

Excess wet weather flows overtop the stop logs and pass through two 60x60-inch tide gates in an adjacent chamber. The PVSC renovation included the installation of new, metal tide gates. From the tide gate chamber flow discharges eastward through a 100-foot, 60-inch outfall to the Passaic River. The outfall is above the water level at low tide and is reported to be totally collapsed. The 1983 PVSC CSO Facility Plan indicated that off line storage was a feasible option at this overflow site. A 1992

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review indicated the outfall appeared unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

014 **Saybrook Place.** Part of the tributary flow is diverted to and from the area tributary to Regulator 15 by an equalizing upstream overflow at Academy and Newark Streets.

The Saybrook Place facility is a standard PVSC regulated overflow type. The common diversion chamber-sandcatcher intercepts a 90x80-inch combined sewer east of McCarter Highway at Saybrook Place. A 48-inch sewer interconnects this chamber with the inlet of the Rector Street regulator 013 about 300 feet to the north. Stop logs divert dry-weather flow into the adjacent regulator chamber through a side outlet

Formerly the side outlet was equipped with a manually operated sluice gate and float operated 12x36-inch regulator gate. The regulator was renovated by PVSC in the early 1980's. The PVSC removed the floats and installed a remote operated regulator sluice gate (open and shut by a telemetered signal from the PVSC Plant). Ultrasonic level sensors may have been installed, however these control sensors are not operational. The regulator flow discharges to the PVSC Main Intercepting Sewer on the west side of McCarter Highway through 60 feet of 36x48-inch intercepting sewer that also intercepts flow from Regulator 013 to the north.

Excess wet weather flows overtop the stop logs and pass through two 78x78-inch tide gates in an adjacent chamber. The PVSC renovation included the installation of new, metal tide gates. From the tide gate chamber flow discharges eastward through a 130-foot, 75-inch outfall to the Passaic River. The outfall is above the river level at high tide. The headwall is reportedly totally collapsed. The 1983 PVSC CSO Facility Plan indicated that off line storage and coarse screening were feasible options at this

KLLC01226

overflow site. A 1992 Review indicated the outfall appeared unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

015. City Dock (McCarter Highway). Part of the tributary flow is diverted to and from the area tributary to Regulator 14 by an equalizing upstream overflow at Academy and Newark Streets.

The City Dock overflow is a standard PVSC regulated overflow type. All elements of regulation are in a single monolithic structure. The diversion chamber-sand catcher is the outlet chamber of a 108-inch combined siphon in Raymond Plaza East, east of Raymond Boulevard. A 42-inch combined sewer also enters the diversion chamber at a higher elevation. Stop logs in the siphon outlet divert dry-weather flow through a rear outlet, formerly equipped with a manually operated sluice gate and float operated 18x42-inch regulator gate into the adjacent regulator chamber that was constructed over the inlet siphon pipe.

The regulator was renovated by PVSC in the early 1980's. The PVSC removed the floats and installed a remote operated regulator sluice gate (open and shut by a telemetered signal from the PVSC Plant). Ultrasonic level sensors may have been installed, however these control sensors are not operational. The regulator chamber flow discharges to the PVSC Main Intercepting Sewer on the west side of Raymond Boulevard through a short 48x66-inch intercepting sewer.

Excess wet weather flow overtops the stop logs and passes through two sets of twin 84x72-inch tide gates in an adjacent chamber. The PVSC renovation included the installation of new, metal tide gates. From the tide gate chamber flow discharges eastward through a 250-foot, 108x90-inch rectangular outfall to the Passaic River. The accessible outlet is partly submerged at low tide. The 1983 PVSC CSO Facility Plan indicated that off-line storage was a

KLL001227

feasible option at this overflow site. A 1992 Review indicated the outfall appeared suitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

Regulators 16 through 18 divert flows to the PVSC Branch Sewer That also serves Harrison East Newark and Kearny.

016. **Jackson Street.** The Jackson Street facility is a standard PVSC regulated overflow type. The diversion chamber-sandcatcher in a common chamber intercepts a 56x64-inch elliptical combined sewer in Jackson Street south of Raymond Boulevard. Stop logs divert dry-weather flow through a side outlet into the regulator that is adjacent to the tide gates.

Flow formerly entered the regulator chamber through a manually operated sluice gate, an 18-inch elbow and a float operated 18-inch gate. The regulator was renovated by PVSC in the early 1980's. The PVSC removed the floats and installed a remote operated regulator sluice gate (open and shut by a telemetered signal from the PVSC Plant). Ultrasonic level sensors may have been installed, however these control sensors are not operational. The regulator flow discharges to the PVSC Branch Intercepting Sewer on the north side of Raymond Boulevard through 60 feet of 24-inch connecting sewer.

Excess wet weather flow overtops the stop logs and passes through two 48x66-inch tide gates in an adjacent chamber. The PVSC renovation included the installation of new, metal tide gates. From the tide gate chamber flow discharges northward through a 165-foot, 64x56-inch elliptical and 60x120-rectangular outfall sewer to the Passaic River. The outfall is partially submerged at low tide.

KLLC01228

The 1983 PVSC CSO Facility Plan indicated that off-line storage was a feasible option at this overflow site. A 1992 Review indicated the outfall appeared unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities, due to the lack of submergence, due to lack of access and surrounding debris.

017. **Polk Street.** The Polk Street wet weather facility is a standard PVSC regulated overflow type. The diversion chamber-sandcatcher in a common chamber intercepts a 84x96-inch elliptical combined sewer in Jackson Street south of Raymond Boulevard. Stop logs divert dry-weather flow through a side outlet equipped with a manually operated sluice gate then through a 70-foot, 24-inch sewer to the regulator on the north side of Raymond Boulevard.

The regulator was renovated by PVSC in the early 1980's. The PVSC installed a remote operated regulator sluice gate (open and shut by a telemetered signal from the PVSC Plant). Ultrasonic level sensors may have been installed, however these control sensors are not operational. The regulator was constructed immediately over the PVSC Brown Street Intercepting Sewer. The regulator flow cascades through a 30x36-inch floor opening directly into the 48-inch PVSC Intercepting Sewer on the north side of Raymond Boulevard.

Excess wet weather flow in the diversion chamber overtops the stop logs and passes through two 84x84-inch tide gates in an adjacent chamber. The PVSC renovation included the installation of new, metal tide gates. From the tide gate chamber, flow discharges northward through a 165-foot, 84x96-inch elliptical outfall sewer to the Passaic River. The outfall is above the water surface at low tide.

KLL001229

The 1983 PVSC CSO Facility Plan indicated that coarse screening was a feasible treatment option at this overflow site. A 1992 Review indicated the outfall appeared unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities, due to the lack of submergence, the open beach area and the eroded condition of the river bank.

018. Freeman Street. The Freeman Street facility is a standard PVSC regulated overflow type. The common diversion chamber-sandcatcher intercepts a 30x40-inch, elliptical combined sewer in Freeman Street and a 24-inch sewer in Raymond Boulevard. Stop logs divert dry-weather flow into the regulator chamber through two side outlets. Formerly each regulator entry was equipped with a manually operated sluice gate and float operated 18-inch gates.

The regulator was renovated by PVSC in the early 1980's. The PVSC removed the floats and installed remote operated regulator sluice gates (open and shut by a telemetered signal from the PVSC Plant). Ultra-sonic level sensors may have been installed, however these control sensors are not operational. The regulator was constructed immediately over the PVSC Brown Street Intercepting Sewer. The regulator flows cascade through a 30x96-inch floor opening directly into the 48-inch PVSC Intercepting Sewer on the north side of Raymond Boulevard.

Excess wet weather flows overtop the stop logs in the diversion chamber and pass northward through 100 feet of 48-inch sewer. At that point the flow traverses two 48x48-inch tide gates in connected chamber. The PVSC renovation included the installation of new, metal tide gates. From the tide gate chamber flow discharges northward through a 70-foot, 48-inch outfall sewer to the Passaic River. The outfall is above the water surface at low tide.

KLL001230

The 1983 PVSC CSO Facility Plan indicated that coarse screening was a feasible treatment option at this overflow site. A 1992 Review indicated the outfall appeared unsuitable for a CSO floatable control demonstration project for end-of-pipe netting facilities, due to the lack of submergence, and because access is blocked by van storage.

Overflows 19 through 21 are nominally separate storm sewers that discharge to the Passaic River in the Ironbound section of eastern Newark. A 1979 Report by Clinton Bogert Associates indicated a number of illicit, polluting, industrial discharges to the tributary storm systems. As part of this project the drainage system will be rechecked to determine whether these sources remain active.

019. Brown Street. This 24-inch outfall discharges to the Passaic River north of the northern end of Brown Street. Until 1970, the Brown Street storm drain was the outfall of a combined sewer system serving the Ironbound district. With the construction of the Lockwood Street drainage system, the system was separated and the overflow on the regulator at Lister Avenue was plugged, and all flow was diverted to the PVSC Brown Street Intercepting Sewer. The outfall remains a local storm drain for the right of way for former Brown Street and the Sherwin Williams factory. A 1979 CBA report indicated that polluted groundwater infiltration may be leaching into this drain. Open the manholes to investigate possible industrial discharge from Sherwin Williams and possible leakage at the former regulator.

020. Lockwood Street. This 72-inch outfall discharges to the Passaic River at the northern end of a right of way north of Lister Avenue and east of Lockwood Street. Large diameter branches of the nominally separate, tributary storm drainage system extend in Lister, Albert and Euclid Avenues, Lockwood Street and the former Morris Canal right of way north of Raymond Boulevard. A tide-gate chamber is located at the eastern end of Lister Avenue.

KLL001231

The 1979 manhole inspection located a number of chemical and industrial discharges. The 1979 CBA Report recommended the disconnections and surface maintenance required to eliminate the pollutant discharge. The City's implementation of the recommendations and enforcement of sewer use ordinance will be determined. Open manholes to verify whether the polluting sources have been disconnected.

The outfall is partially submerged at low tide and is accessible. A 1982 Review indicated the outfall appeared suitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

021. Blanchard Street. This tide-gated 24-inch storm system outfall discharges to the Passaic River at the northern end of Blanchard Street. The storm drain serves the length of Blanchard Street north of Raymond Boulevard including railroad ditch drainage. The sewer was originally combined but was cleaned and separated in 1970 when a northward flowing, parallel 15-inch sanitary sewer was constructed. The 1979 CBA Report indicated that the intercepted railroad ditch flow was polluted. Also, surcharged sewage from the manholes on the partially clogged sanitary sewer frequently overflowed into the street and the adjacent storm system. The downstream 1300 feet were in danger of structural collapse and were recommended for replacement. Cleaning of the sewer was also recommended. The City's implementation of the recommendations and enforcement of sewer use ordinance will be determined. Investigate the noted points of polluted discharge into the system.

KLL001232

Overflow 022 is the only regulated combined system overflow to the Passaic River that is owned and operated by the City of Newark.

022. **Roanoke Avenue.** This 60-inch outfall discharges to the Passaic River in a right of way southeast of Roanoke and Doremus Avenues. Dry-weather flow is diverted to the southward-flowing, 24-inch intercepting sewer in Doremus Avenue by a combined sewage regulator-storage module at Roanoke and Doremus Avenues, about 500 feet west of the outfall. The module was constructed in 1983 and replaced a mechanically operated regulator at the same location. Flow in the dry-weather outlet is controlled by an electrically operated knife gate-valve.

The wet-weather outlet is controlled by a hydraulically operated flap gate based on the level of the stored sewage. The gate openings are interconnected so that opening the flap gate closes the knife gate. Operating problems due to corrosive wastes and humidity in the operating chamber have necessitated the refurnishing of mechanical and electrical equipment in the regulator chamber. The extent of the refurnishing will to be investigated. When the flap gate opens, all flow is diverted to the Passaic River through a 500-foot, 60-inch outfall. There are two tide gate chamber on the outfall about 200 feet from the River. Determine the location and operating condition of these tide-gate.

The outfall is partially submerged at low tide and is accessible. A 1992 Review indicated the outfall appeared suitable for a CSO floatable control demonstration project for end-of-pipe netting facilities.

KLL001233

Permitted overflows 023 through 030 discharge to the Peripheral Ditch that encircles Newark Airport, and to its tributary ditches north and west of the Airport.

023. Adams Creek. The Adams Creek outfall is the combined and storm outlet that drains a large, highly-industrial area north of Newark Airport. The dry weather flow from this area enters the intercepting sewer that conveys flow eastward in Emmet Street, northward in Avenue C and Dawson Street, and eastward in South Street. By a series of interconnections and overflows at locations along the intercepting sewer including one at Dawson and South Streets, excess wet-weather flow is diverted to major discharge pipes in Thomas and Adams Streets. The location and configuration of these internal overflows is to be determined.

The wet weather flow leaves the populated area at the foot of Adams Street north of the rail transportation corridor in a 48x144-inch sewer. The outfall extends about 2400 feet southwestward across the rail corridor to an outfall structure on Adams Creek a tributary of Peripheral Ditch, directly south of Frontage Road and north of the Route 1, 78 Turnpike interchange about 1000 feet from the west end of Frontage Road. The outfall is twin 54-inch and twin 48x72-inch under the railroads and 84x84-inch between the railroad and the outfall. About 500 feet of the 84x84-inch outfall was constructed directly over the 84-inch Southside Intercepting Sewer. A 36-inch branch connection is available for future CSO interception.

024. 030. Wheeler Creek and Avenue A. The Avenue A outfall is the combined and storm outlet that drains a large area northwest of Newark Airport mostly west of Amtrak. The dry weather flow from this area enters the intercepting sewer that conveys flow eastward from McCarter Highway in Emmet Street, northward in Avenue C and Dawson Street, and eastward in South Street. A regulator at Emmet Street

KLL001234

and McCarter Highway and possibly other interconnections and overflows, divert excess wet-weather flow to a major discharge sewers in Poiner Street and Avenue A. An overflow at Earl Street and Frelinghuysen diverts surcharges to and from the Peddie District. The configuration and location of these internal overflows and the configuration of the regulators is to be determined.

The wet weather flow leaves the populated area in the Avenue A sewer north of the rail transportation corridor in a 60x156-inch sewer. The outfall extends from Poiner Street about 1500 feet southeastward to the foot of Avenue A and across the rail corridor to an outfall structure at the head of Wheeler Creek a tributary of Peripheral Ditch, 400 feet north of a Route 78 access ramp to Newark Airport. The outfall is 60x156-inch north of the first railroad crossing, quadruple 57-inch flat bottom pipe under the Bay railroad and 94x162-inch semicircular under the Lehigh and Pennsylvania railroads and at the Avenue A outfall 030.

South of the Bay Railroad, the Wheeler Ditch outfall, 024, parallels the 030 outfall to the east. It extends under the Lehigh Railroad in twin 60-inch pipes and under the Pennsylvania Railroad in twin 36-inch pipes to the same outfall structure as 030. Prior to 1945, the Wheeler outfall conveyed all Avenue A flow. When the Avenue A Sewer was extended under the Lehigh and Pennsylvania Railroads, the Wheeler outfall was modified to convey only railroad drainage. There are open sections of this outfall between the railroad crossings.

The Southside Intercepting Sewer crosses under Wheelers Creek about 300 feet south of the 024, 030 outfall. A 36-inch branch connection is available for future CSO interception.

KLL001235

When constructed in 1965, the flow entered the Queen Ditch immediately beyond the diversion structure. Based on a recent aerial survey it appears that the upper 100 feet of the Queen Ditch has been channelized under the foot of International Way to discharge north of that street. Reportedly, the whatever wet-weather outlet was provided has been clogged, and practically all wet weather flow is forced into the Southside Intercepting Sewer. The investigation of the outfall condition requires investigation.

027. 029. Waverly and Busch. The hydraulically interconnected Waverly and Busch sewers serve portions of southwestern Newark that are north of the Elizabeth boundary and east of Weequahic Park. The 96-inch Waverly inlet sewer conveys combined flows from the west across the Amtrak and Greenville Branch tracks south of Van Duyne Street to the common "027" diversion structure 1400 feet west of Route 1 in the southwest corner of the Anhueser Busch property. A force main serving all of Newark airport also enter this regulator or the Southside Intercepting Sewer at this site.

The 36-inch Busch inlet sewer conveys combined flows from the north in Busch property on the west side of Route 1 to the Busch diversion manhole "029". At that diversion manhole, dry weather flow is diverted eastward 1250 feet in a 36 inch interceptor for re-diversion at the Waverly Diversion Structure "027".

In the Waverly diversion-outlet structure, the Waverly and Busch dry weather flows are diverted northward in a 48x60-inch cross trench that spans the 18-foot width of the structure. The diverted flow enters a regulator chamber through a sluice gate and float operated regulator gate on a 48x28-inch orifice.

KLL001236

Downstream, the regulated flow passes through an orifice gate, a short 48x48-inch connector, a Parshall flume with a 24-inch throat before entering directly into upper end of the 54-inch Southside Intercepting Sewer.

There is no sandcatcher on the sewers tributary to the Waverly diversion structure. Meter, intercepting sewer, and gate operating problems occur due to excessive siltation. In 1988 the PVSC authorized a study to determine the feasibility of installing a sandcatcher upstream of the diversion, but have not implemented sandcatcher construction because of its high cost.

Excess wet weather at the Waverly diversion structure "027" overtops a stop log weir and continues eastward 1600 feet to the Waverly Ditch that discharges into the Peripheral Ditch in the Newark Airport parking fields. Between the diversion structure and west of Route 1, the outfall is 96-inch. Under Route 1, the Waverly outfall is 90-inch, however at the start of the 90-inch outfall, a portion of the flow is shunted northward to the Busch outfall. Flow discharges to the Waverly Ditch at a common headwall with the Busch outfall east of Route 1. A single 90-inch tide gate prevents tidal ditch flow from entering the Waverly outfall.

Excess wet weather at the Busch diversion manhole "029" overtops a stop log weir in the wet-weather outlet invert, then continues eastward 350 feet across Route 1 to the Waverly Ditch. Between the diversion manhole and the edge of Route 1, the outfall 36-inch. Under Route 1, the Busch outfall that includes some shunted Waverly flow is 64x96-inch under the southbound lanes and 48-inch under the northbound lanes to the headwall. Flow discharges to the Waverly Ditch at the common headwall that houses the Waverly Outlet. A single 48-inch tide gate prevents tidal ditch flow from entering the Busch outfall.

KLL001237

028. Haynes Street. At present, details of the Haynes Street overflow have not been obtained. Based on incomplete information, the sewer appears to convey combined flows northward in the west side of Route 1. The combined sewer extends between Haynes Avenue and a 54-inch wet-weather outlet into a channel under Route 1, that conveys flow from Adams, Peddie, Queen and Wheeler Ditches to the Peripheral Ditch. The fate of the dry weather flow and interception details need to be determined. The outfall reportedly discharges raw dry weather flow.

KLLC01238

027 - WAVERLY STREET OUTLET
Inspection date 7/08/92

Existing Configuration - Combined sewage enters from a 96" brick sewer and the force main for Newark Airport and flows into a cross trench. Diverted flow enters the regulator chamber through a sluice gate and float operated regulator gate. This setup appears functional. The flow exits the regulator chamber through an orifice gate. Downstream, flow passes through a Parshall flume, but meters appear inoperable. The flow then enters into the connecting sewer. Overflows exit through a 96" brick pipe and travel under routes 1&9 and discharge into the Peripheral ditch.

Condition - All components appear in good condition

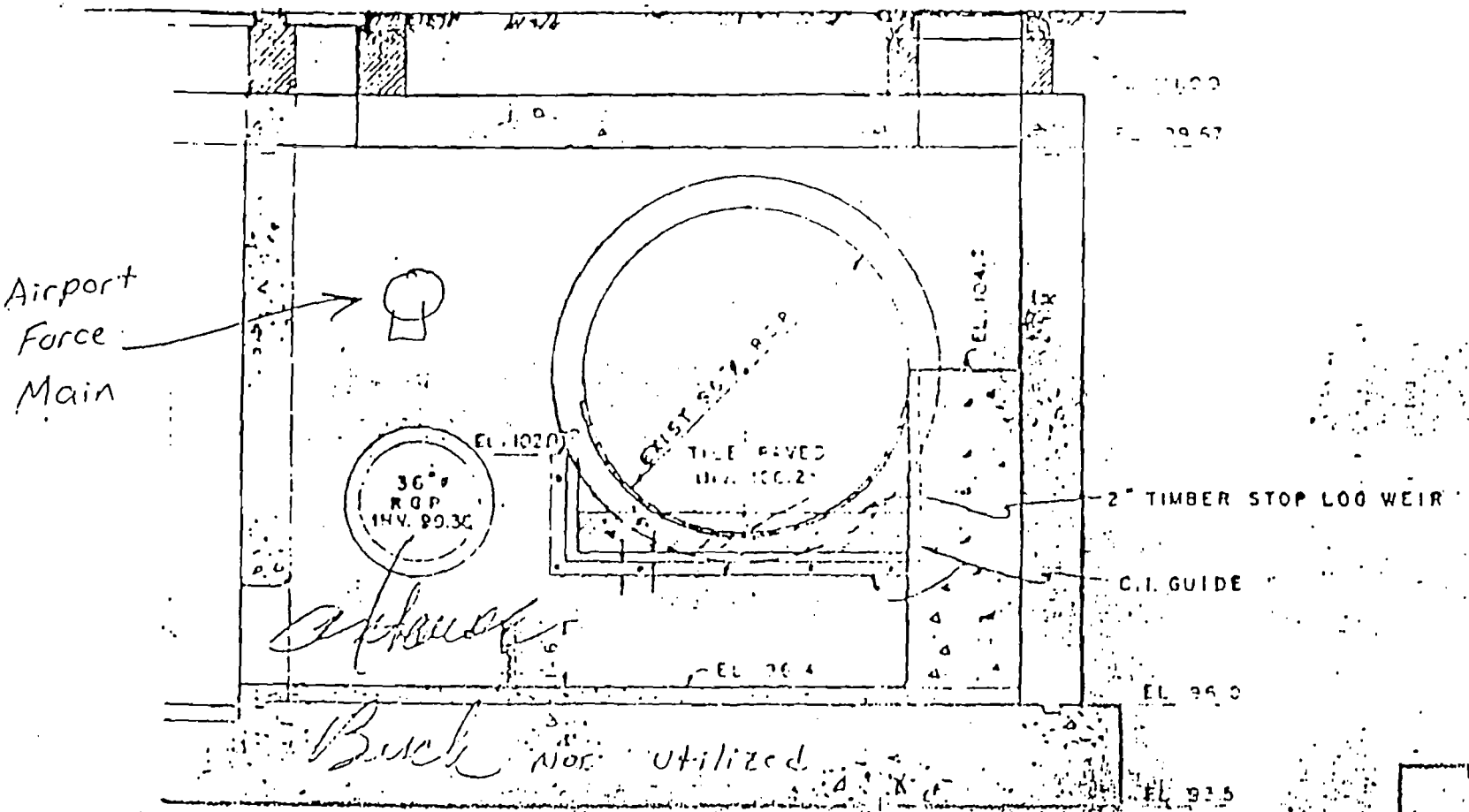
Problems - Meters not functioning.

Dry Weather Overflows - None noted

Inverts - Provided on existing plans

Additional Information - Sandcatcher not present

Anhueser Busch conducted extensive investigation to determine cause of their flooding problems. They found that in 1989, the airport covered the outlet pipes for security reasons. They also concluded that the interceptor was backing up from Queen and Peddie outfalls. Therefore they were receiving not only influent from the Waverly trunk line, but also from the Peddie and Queen structures where the interceptor would fill up. They redirected flow away from overflow 029 and plugged it up. Furthermore, they located all of their discharge points to downstream of the diversion structure. Report from Anheuser Busch to be forwarded upon receipt.



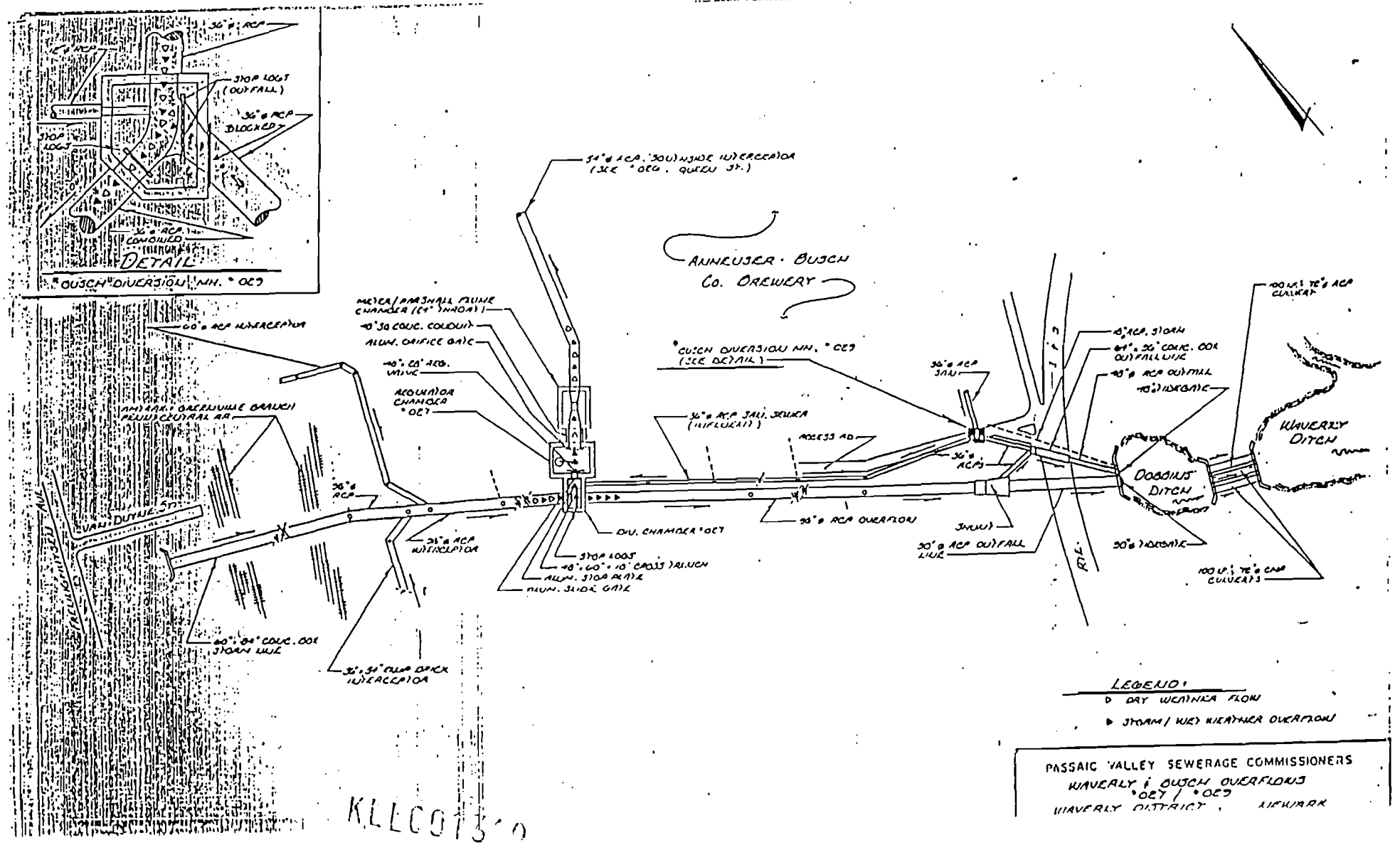
SECTION E-E

SOUTH

WAVER

Designed By ... Drawn By ...

KLL001318



DETAIL
"BUSCH" DIVERSION MH. #029
STOP LOGS (OUTFALL)
36" ø RCP BLOCKED
36" ø RCP COMBINED
54" ø RCP, SOUTHSIDE INTERCEPTOR (SEE #029, QUEEN ST.)
ANHEUSER - BUSCH CO. BREWERY
METER/PARSHALL FLUME CHAMBER (24" THROAT)
48" SQ CONC. CONDUIT
ALUM. ORIFICE GATE
48" x 28" REG. VALVE
REGULATOR CHAMBER #027
60" ø RCP INTERCEPTOR
AMTRAK - GREENVILLE BRANCH PENN CENTRAL RR
VAN DUYNE ST.
36" ø RCP
36" ø RCP INTERCEPTOR
60" x 84" CONC. BOX STORM LINE
36" x 54" ELLIP BRICK INTERCEPTOR
DIV. CHAMBER #027
STOP LOGS
48" x 60" x 10' CROSS TRENCH
ALUM. STOP PLATE
ALUM. SLIDE GATE
"BUSCH DIVERSION MH. #029 (SEE DETAIL)
36" ø RCP SAN. SEWER (INFLUENT)
ACCESS RD
36" ø RCP OVERFLOW
36" ø RCP SAN
36" ø RCPs
SHUNT
30" ø RCP OUTFALL LINE
18" RCP, STORM
64" x 36" CONC. BOX OUTFALL LINE
48" ø RCP OUTFALL
48" ø TIDEGATE
30" ø TIDEGATE
100 LF; 72" ø CMP CULVERTS
100 LF; 72" ø RCP CULVERT
DOBBINS DITCH
WAVERLY DITCH
LEGEND:
DRY WEATHER FLOW
STORM / WET WEATHER OVERFLOW
PASSAIC VALLEY SEWERAGE COMMISSIONERS
WAVERLY & BUSCH OVERFLOWS
#027 / #029
WAVERLY DISTRICT, NEWARK

KLLC013'0

ABI - NEWARK BREWERY
pH NEUTALIZATION SYSTEM - BACKFLOODING ISSUE

Presentation To PVSC
October 6, 1989
Southside Interceptor System Restrictions

KLL001322

PRESENTATION OUTLINE

Chart No.	Description
1	Design Intent - During Dry Weather Flows
2	Profile - Flow Levels During Dry Weather Flows
3	Design Intent - During Wet Weather Flows
4	Existing Conditions - During Wet Weather Flows
5	Profile - Existing Situation During Wet Weather Flows
6	Sewer Capacities and Design Values
Pictures	Storm water outfall across Hwy from Brewery
	[redacted]
	Waverly Diversion Structure
	Queens Diversion Structure
	Peddie Diversion Structure

KLL001323

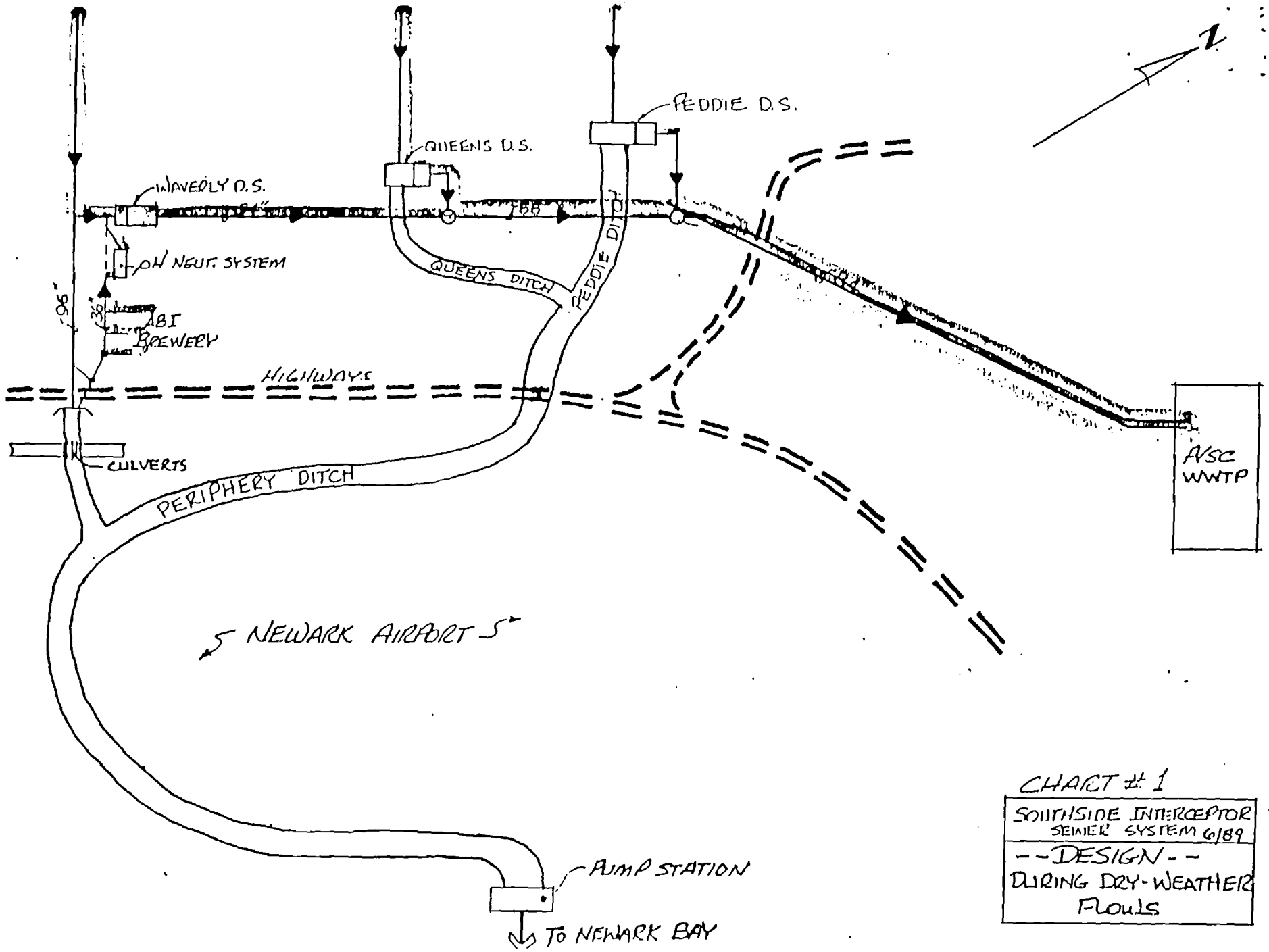


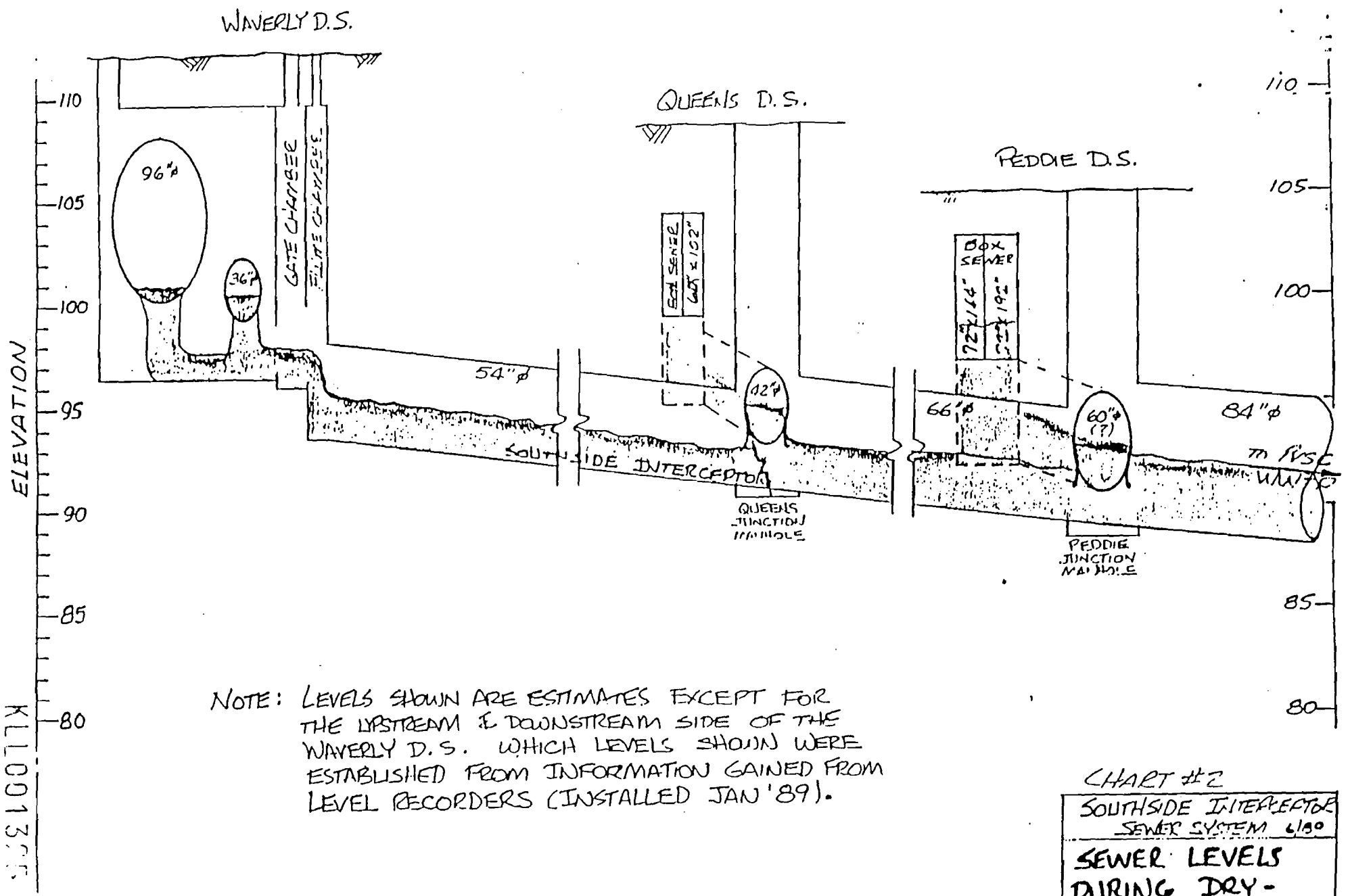
CHART # 1

SOUTHSIDE INTERCEPTOR SEWER SYSTEM 6/89

--DESIGN--

DURING DRY-WEATHER FLOWS

KLL001324

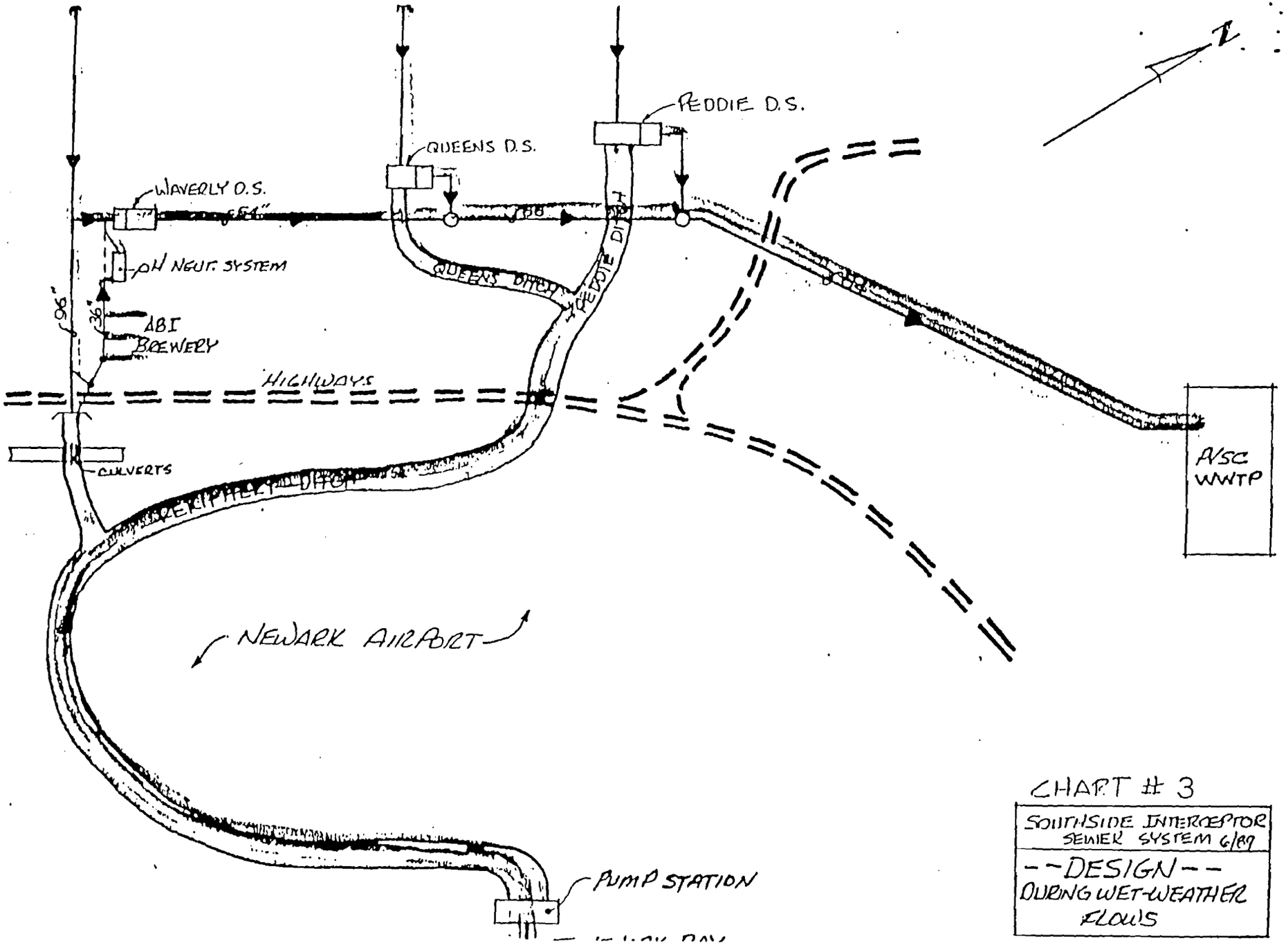


NOTE: LEVELS SHOWN ARE ESTIMATES EXCEPT FOR THE UPSTREAM & DOWNSTREAM SIDE OF THE WAVERLY D.S. WHICH LEVELS SHOWN WERE ESTABLISHED FROM INFORMATION GAINED FROM LEVEL RECORDERS (INSTALLED JAN '89).

CHART #2

SOUTHSIDE INTERCEPTOR SEWER SYSTEM 6/90

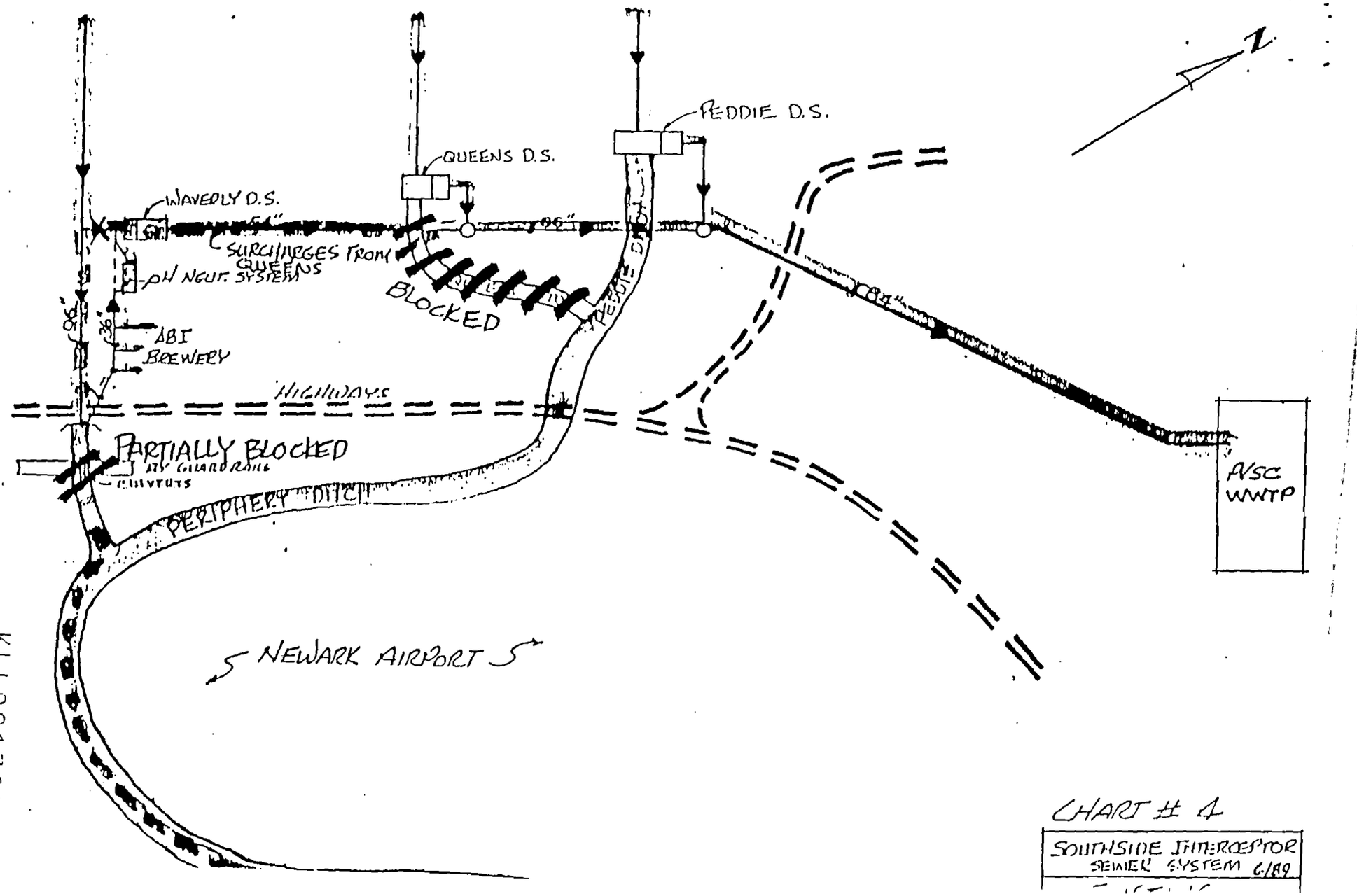
SEWER LEVELS DURING DRY-



KLL0013327

CHART # 3

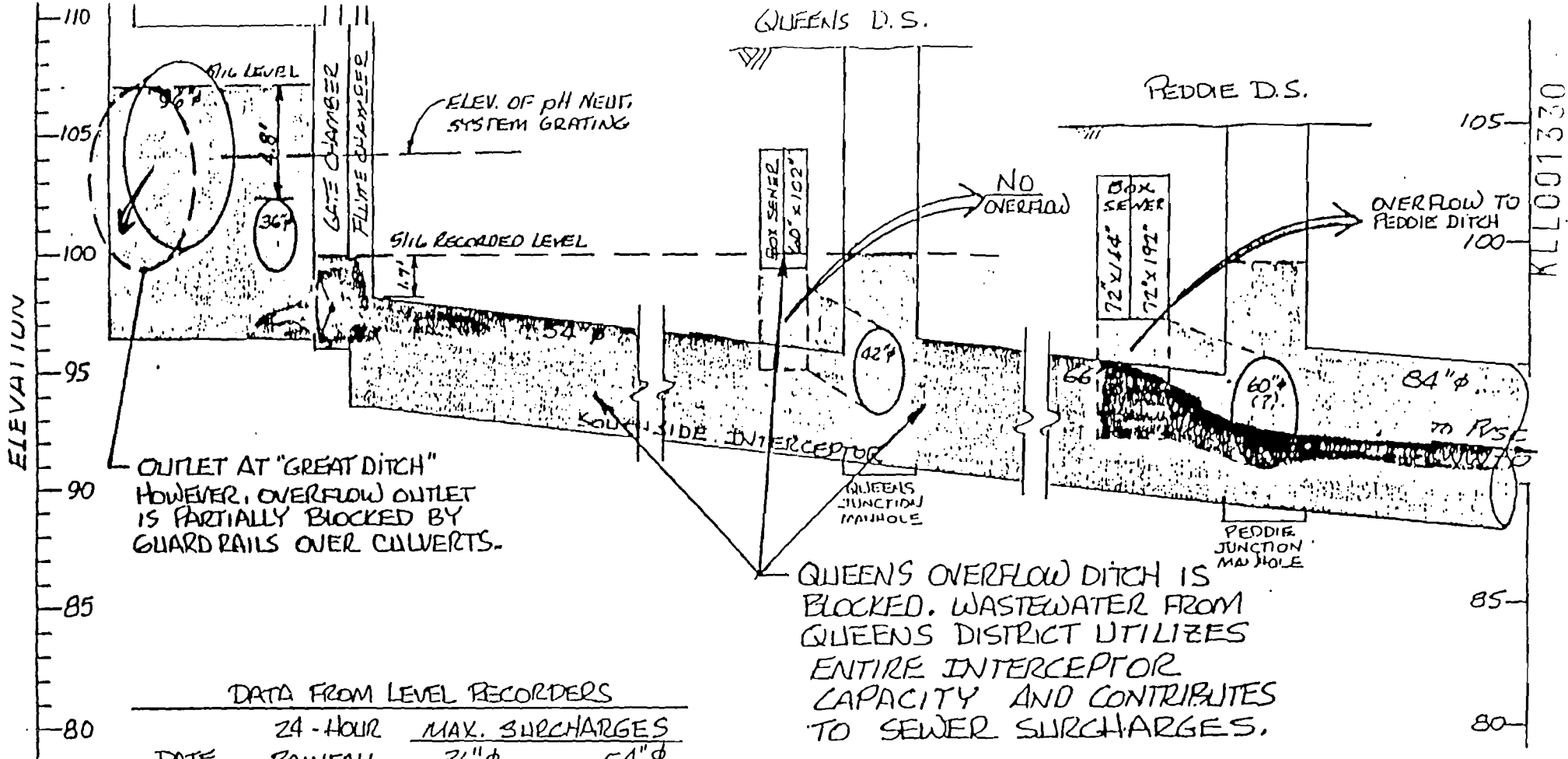
SOUTHSIDE INTERCEPTOR SEWER SYSTEM 6/89
--DESIGN-- DURING WET-WEATHER FLOWS



KLL0013328

CHART # 4

SOUTHSIDE INTERCEPTOR SEWER SYSTEM 6/89



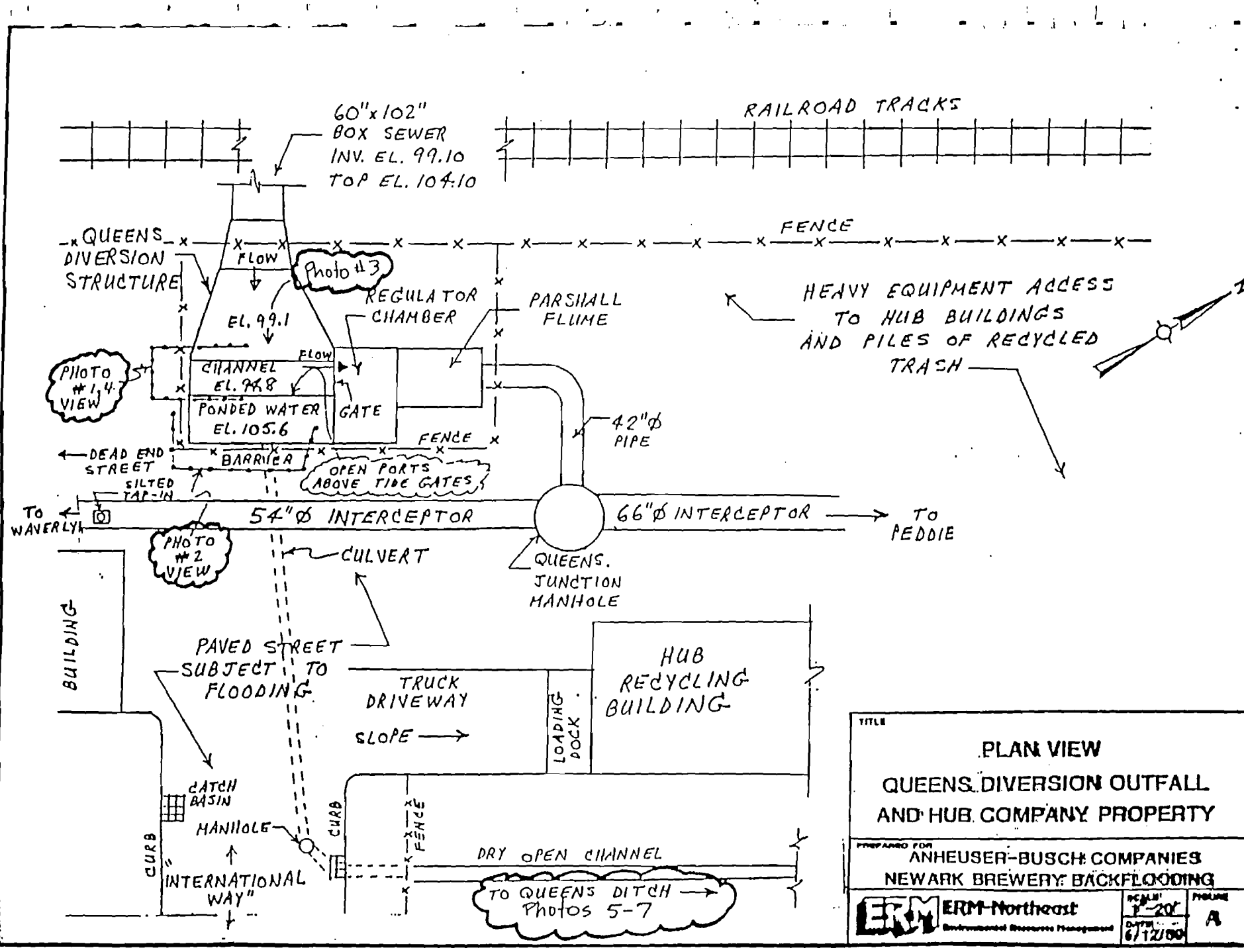
DATA FROM LEVEL RECORDERS

DATE	24-HOUR RAINFALL	MAX. SURCHARGES 36"φ	MAX. SURCHARGES 54"φ	
5/2/89	0.93"	2.1'	1.3'	
5/10	1.68	3.6	0.8	
5/16	2.11	4.8	1.7	LEVELS SHOWN ABOVE
5/17	0.71	3.4	1.2	
6/9	1.8	NA	0.0	
7/5	2.45	4.7	2.5	
9/19	ab 2	3.4	2.5	
9/20	1.95	3.2	1.2	

CHART #5

SOUTHSIDE INTERCEPTOR SEWER SYSTEM 6/90

EXISTING INTERCEPTOR SITUATION DURING WET-WEATHER FLOW CONDITIONS



TITLE

PLAN VIEW
QUEENS DIVERSION OUTFALL
AND HUB COMPANY PROPERTY

PREPARED FOR
ANHEUSER-BUSCH COMPANIES
NEWARK BREWERY BACKFLOODING

ERM ERM-Northeast
Environmental Resources Management

SCALE: 1"=20'
DATE: 6/12/00
FIGURE: A

KLL0015 25

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection
Division of Water Quality
Bureau of Water Quality Analysis
CN029
Trenton N.J. 08625-0029
Tel. (609) 633-7020
Fax (609) 984-2147

Robert C. Shinn, Jr
Commissioner

CERTIFIED MAIL

Mr. Daniel Berardinelli, P.E.
Manager, Div. Sewers & Water Supply
1229 McBride Avenue
Little Falls, NJ 07424

JUN 30 1995

Dear Mr. Berardinelli:

SUBJECT: New Jersey Pollutant Discharge Elimination System
Individual NJPDES/DSW General Permit Authorization No. NJ0108758
Termination of Individual NJPDES/DSW Permit No. NJ0024724
City of Newark

Enclosed is an Individual NJPDES/DSW General Permit Authorization under the General Permit for Combined Sewer Systems, NJPDES Permit No NJ0105023, issued by the New Jersey Department of Environmental Protection on January 27, 1995. Also, enclosed is a termination of the Individual NJPDES/DSW Permit No. NJ0024724. The individual NJPDES/DSW general permit authorization and the individual NPDES/DSW permit termination are issued in accordance with the New Jersey Pollutant Discharge Elimination System (NJPDES) Regulations, N.J.A.C. 7:14A-1 et seq.

The individual general permit authorization authorizes the City of Newark to operate a combined sewer system for the collection and conveyance of wastewater and to discharge untreated wastewater in the form of combined sewer overflows from the combined sewer overflow points listed on Table CSO-1 of the authorization in accordance with the terms and conditions of the General Permit for Combined Sewer Systems NJPDES Permit No. NJ0105023. The Individual NJPDES/DSW Permit termination terminates all terms and conditions of NJPDES Permit No. NJ0024724 applicable to the operation of a combined sewer system and the discharge of combined sewer overflows. The terms and conditions of the General Permit for Combined Sewer Systems NJPDES Permit No. NJ0105023 supersede the terms and conditions of the Individual NJPDES/DSW Permit No. NJ0024724

Should you have any questions regarding this permit action, with the terms and conditions of the General Permit for Combined Sewer Systems and/or the termination of the Individual NJPDES/DSW Permit NJ0024724, please contact Mr. Dan Zeppenfeld at (609) 633-7020.

Sincerely,

Shing-Fu Hsueh, Chief
Bureau of Water Quality Analysis

Enclosures

C: Mr. Luiggi Campana, Dir.

KLE091559

NJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDES

PERMIT NUMBER NJ0108758

Permittee	Co-Permittee
NEWARK CITY OF CITY HALL ROOM B331F 920 BROAD STREET NEWARK NJ 07102	

Property Owner	Location of Activity
NEWARK CITY OF CITY HALL, ROOM NO B31F 920 BROAD STREET NEWARK NJ 07102	NEWARK CITY OF CITY HALL ROOM B31F 920 BROAD STREET NEWARK NJ 07102

Current Authorization Covered By This Approval And Previous Authorization	Issuance Date	Effective Date	Expiration Date
CSO:COMBINED SEWER OVERFLOW	06/30/1995	07/01/1995	02/28/2000

By Authority of:
Commissioner's Office

DEP AUTHORIZATION
Shing-Fu Hsueh, Chief
Bureau of Water Quality Analysis
Division of Water Quality

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NJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDES

NJ0108758

NJPDES/DSW PERMIT NUMBER NJ0108758
INDIVIDUAL AUTHORIZATION PAGE CONTINUED

This individual general permit authorization authorizes the City of Newark to operate a combined sewer system for the collection and conveyance of wastewater and to discharge untreated wastewater in the form of combined sewer overflows from the combined sewer overflow points listed on Table CSO-I, of this authorization, in accordance with the terms and conditions of the General Permit for Combined Sewer Systems NJPDES Permit No. NJ0105023.

TABLE CSO-I

001	Meadowbrook	40°47'17"	74°10'17"	Second River
002	Verona Avenue	40°46'07"	74°09'06"	Passaic River
003	Delavan Avenue	40°46'07"	74°09'27"	Passaic River
004	Herbert Place	40°45'57"	74°09'34"	Passaic River
005	Herbert Place	40°45'57"	74°09'34"	Passaic River
006	Oriental Avenue	40°45'34"	74°09'53"	Passaic River
007	Third Avenue	40°45'28"	74°09'55"	Passaic River
008	Fourth Avenue	40°45'22"	74°09'56"	Passaic River
009	Clay Street	40°45'03"	74°09'58"	Passaic River
010	Clay Street	40°45'03"	74°09'58"	Passaic River
011	Orange Street	40°44'47"	74°10'01"	Passaic River
012	Bridge Street	40°44'42"	74°10'01"	Passaic River
013	Rector Street	40°44'29"	74°09'56"	Passaic River
014	Saybrook Place	40°44'26"	74°09'54"	Passaic River
015	City Dock	40°44'07"	74°09'45"	Passaic River
016	Jackson Street	40°43'59"	74°09'19"	Passaic River
017	Polk Street	40°43'58"	74°09'10"	Passaic River
018	Freeman Street	40°44'03"	74°08'46"	Passaic River
019	Brown Street	40°44'26"	74°08'19"	Passaic River
020	Lockwood Street	40°44'30"	74°07'53"	Passaic River
021	Blanchard Street	40°44'30"	74°07'40"	Passaic River
022	Roanoke Avenue	40°43'34"	74°07'17"	Passaic River
023	Adams Street	40°42'42"	74°10'12"	Peripheral Ditch
024	Wheeler	40°42'49"	74°10'47"	Peripheral Ditch
025	Peddie Street	40°42'36"	74°11'06"	Peripheral Ditch
026	Queen	40°42'20"	74°11'12"	Peripheral Ditch
027	Waverly	40°41'25"	74°11'26"	Peripheral Ditch
028	Haynes Avenue	40°42'23"	74°11'00"	Peripheral Ditch
029	Waverly	40°41'25"	74°11'26"	Peripheral Ditch
030	Avenue A	40°42'49"	74°10'47"	Peripheral Ditch

KLL001360

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PERMIT NUMBER NJ0024724

Permittee	Co-Permittee
NEWARK CITY OF CITY HALL ROOM B331F 920 BROAD STREET NEWARK NJ 07102	

Property Owner	Location of Activity
NEWARK CITY OF CITY HALL, ROOM NO B31F 920 BROAD STREET NEWARK NJ 07102	NEWARK CITY OF CITY HALL ROOM B31F 920 BROAD STREET NEWARK NJ 07102

Current Authorization Covered By This Approval And Previous Authorization	Issuance Date	Effective Date	Expiration Date
A :SANITARY SURFACE WATER DISCH	07/01/1986	07/01/1986	TERMINATED

By Authority of:
Commissioner's Office

DEP AUTHORIZATION
Jeffrey Reading, Chief
Bureau of Watershed Permitting
Division of Water Quality

NJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDESNJPDE

RFA REVIEW CHECKLIST

FACILITY NAME Newark, N J.

REVIEWED BY Margaret Ebrahim DATE OF REVIEW 4/17/95

Note: Place a check mark in the first column if item has NOT been accomplished by applicant. Write NA if the item does not apply to applicant. In second column write Date of Compliance (DOC) when item has been complied with.

	DOC		
			RFA FORM
		1.a	Facility name
		.b	Facility mailing address
see comments		2.a	Authorized representative's name
		.b	" " address
		.c	" " business telephone number
		3.	Facilities and/or activities to be authorized:
		.a	Owner and/or operator of CSC and/or Conveyance System
		.b	Owner and/or operator of a Combined Sewer Overflow Point
		.c	Owner and/or operator of a Combined Sewer Overflow Control Facility
		.d	Other
		4.	The EPA identification number of the facility (if assigned)
		5.a	SIC Code
		.b	Short Title
		6.a.i	Facility owner's name
		a.ii	" " address
		a.iii	" " business telephone number
		a.iv	Federal Tax Identification Number of the Owner
		a.v	Owner identified as a Federal, State, other public agency or private entity
NFED	X	b.i	Facility operator's name
	X	b.ii	" " address
	X	b.iii	" " business telephone number
		c.i	Authorized agents name
		c.ii	" " address
		c.iii	" " business telephone number
		d.i	Authorized engineer's name

04/11/95

Request I.D. of operator & details of CSO Control Facilities Configuration.

KLL001363

		1.	Copy of the USGS topographic map, 7.5 minute quadrangle series
		2.	Location of the facility(ies) on USGS map
		3.	Name of the quadrangle(s)
✓		4.	Delineation of the service area of the collection systems on USGS map
		5.	Alignment of conveyance systems (interceptors, force mains, trunk sewers, etc) on USGS map
✓		6.	Location and/or alignment of combined sewer overflow control facilities (regulators) on USGS map
		7.	Corresponding combined sewer overflow points (i.e., ends of outfalls and/or other discharge structures) on USGS map
			COMMENTS: #5 could be clearer; combined + interceptor pipes have very similar lines in legend.
			ATTACHMENT 5
✓		1.	A brief narrative description of the facility(ies), collection system, combined sewer overflow point, or combined sewer overflow control facility
			COMMENTS: Discription of entire system given; not each CSO point & regulator's relationship to system.
			ATTACHMENT 6
			Newspaper Notice:
		1.	Copy of notice published in a daily or weekly newspaper within the area affected by the permitted facility
		.a	Owner/operator name included in notice
		.b	" " address included in notice
		.c	Facility name included in notice
		.d	" address included in notice
		.e	Type of facility included in notice
		.f	Type of discharge included in notice
✓		2.	Publication section of notice identified
✓		3.	Publication page of notice identified
			COMMENTS:
			FORM A - SCHEDULE OF CSO POINTS
		1.	Discharge Serial Number for each CSO point
		2.	CSO Diacharge Point Name for each CSO point
		3.	Latitude of the end of the CSO point for each CSO point
		4.	Longitude of the end of the CSO point for each CSO point
		5.	Name of the receiving waterbody for each CSO point
✓		6.	Description of any type of treatment to CSO prior to discharge for each CSO point
			COMMENTS: Newark used their own form. Complete
			Names of CSO points missing - 1 ⇒ Meadowbrook & this Meadowbrook Ave ? " St ? " Rd ?

04/11/95

KLL001364

		4.	Name of Permittee
		5.	Authorization Number
			COMMENTS:
			ATTACHMENT E - Authorized Representative Certification
See comments		1.	Owner's Certification
		2.	Operator's Certification
		3.	Government or Public Agency Signature
		4.	Signature of Agaent/Authorized Representative
		5.	Name of Permittee
		6.	Authorization Number
			COMMENTS: Name differs here from name on RFA application
			ATTACHEMENT F - Interim Solids/Float. Control Meas. Imp. Cert.
		1.	Owner's Certification
		2.	Operator's Certification
		3.	Government or Public Agency Signature
		4.	Name of Permittee
		5.	Authorization Number
			COMMENTS:
			ADDITIONAL INFORMATION REQUIRED BY DEPARTMENT:
		1.	Data
		2.	Reports
		3.	Specifications
		4.	Plans
		5.	Permits
		6.	Other

KLL001365

NAME	ORGANIZATION	PHONE
Dan Zeppenfeld	BCCP	609-633-7020
William M. Lee	HydroQual	201-529-5151
Gene Driscoll	HydroQual	201 529-5151
John Rolak	Killam Assoc.	908-534-4700
Mark Ferko	TEP/CCA	609 655-2854
Tracy Harrington	BCCP	609-984-4429
Jehan Khalil	BCCP	609-984-4429
Paul Baldauf	BCCP	609-984-4429
Gautam R Patel	BCCP	(609) 984 4429
Paul Liu	DEP	(609)-633-7020

TVSC CSO CHARACTERIZATION STUDY

2/21/96

NAME	ORGANIZATION	PHONE
DAN ZEPPENFELD	BCCP	609-633-7020
WILLIAM M. LEE	HydroQual	201-529-5151
Gene Driscoll	HydroQual	201 529-5151
John Rolak	Killam Assoc.	908-534-4700
MARC FEELEY	DEP/CWA	609 633-2854
TRACY HARRINGTON	BCCP	609-984-4429
Jehan Khalil	BCCP	609-984-4429
PAUL BALDAUF	BCCP	609-984-4429
Gautam R Patel	BCCP	(609) 984 4429.
Phil Liu	DEP	(609)-633-7020

Newark

Sharpe James
Mayor

Department of Water and Sewer Utilities

920 Broad Street
Newark, New Jersey 07102
201-733-6578

Luiggi Campaña
Director

RECEIVED

JAN 24 1996

Div of Water Quality
Bureau of Water
Quality Analysis

Bureau of Permit Management
Division of Water Quality
N J D E P
CN-029
Trenton, NJ 08625-0029
Attn.: Dan Zeppenfeld

Sub: City of Newark - CSO NJPDES Permit -Change in the name of Authorized persons

Dear Mr. Zeppenfeld:

This is to inform you that due to some organizational changes in the Department of Water and Sewer Utilities there are changes in the names of authorized representatives for the City's Combined Sewer System NJPDES permit. Please replace the earlier authorized representative certification (*attachment E*) in the RFA with the enclosed.

If you need any additional documents or further clarification on this matter, please contact Mr. Sanjeev Varghese of my office at 201-256-4965.

Very truly yours,

Luiggi Campana, Director,
Department of Water & Sewer Utilities

cc: Anthony DeBarros, Acting Manager
Andrew Pappachen, Supervising Engineer.
Sanjeev Varghese, Principal Engineer, Hydraulics.

KLL001368

GENERAL PERMIT NJ0105023

ATTACHMENT E

AUTHORIZED REPRESENTATIVE CERTIFICATION

(OPTIONAL)

I, the owner and/or I, the operator authorize the below named person to act as our agent/ representative in all matters that pertain to our Request for Authorization, and/or for administrative actions relative to complying with the requirements as they apply to our facilities authorized under the NJPDES General Permit No. NJ0105023.

The name and address of the Agent/Authorized Representative is:

NAME: ANTHONY DeBARROS/SANJEEV VARGHESE

ADDRESS: 1294 McBride Avenue

CITY/TOWN: Little Falls

STATE & ZIP CODE: NJ 07424

OWNER'S CERTIFICATION
CORPORATION:(vice president or higher)

(signature) (print name)
__/__/__ (date)

PARTNERSHIP OR SOLE PROPRIETORSHIP:
(general partner or proprietor)

(signature) (print name)
__/__/__ (date)

GOVERNMENT OR PUBLIC AGENCY:
(principal executive officer or ranking elected official)

(signature) Luiggi Campana (print name)
__/__/__ (date)

OPERATOR'S CERTIFICATION
CORPORATION:(vice president or higher)

(signature) (print name)
__/__/__ (date)

PARTNERSHIP OR SOLE PROPRIETORSHIP:
(general partner or proprietor)

(signature) (print name)
__/__/__ (date)

GOVERNMENT OR PUBLIC AGENCY:
(principal executive officer or ranking elected official)

(signature) Luiggi Campana, Director (print name)
__/__/__ (date)

(Only one person need sign when the owner and operator are the same. Both parties must sign when owner and operator are separate and distinct.)

I, the undersigned, agree to serve as agent/authorized representative for the above listed owner and /or operator.

(Signature of Agent/Authorized Representative)

Name of Permittee: CITY OF NEWARK

Authorization Number: NJ 0105023

E PRINTED ON 01/25/95

KLL001369

DATE: 04/06/95 N J P D E S SCREEN: DSSB165A
TIME: 17:00:34 CHANGE FACILITY INFORMATION TERMINAL: #00M

FACILITY EPA NUMBER: EPANJD000557934 NUMB OF CO-OWNERS: 001

LOCATION ADDRESS

CURRENT NAME: NEWARK CITY OF ACTIVE(Y/N) : Y
PREVIOUS NAME: NEWARK DEPT OF ENGINEERING INACTIVE DATE:
ADDRESS: CITY HALL ROOM B31F MMDDYYYY
: 920 BROAD STREET
CITY: NEWARK STATE: NJ ZIP: 07102 -

CONTACT: LUIGGI CAMPANA PHONE: 201 733 6303

MAILING ADDRESS PERMITS

NAME: NEWARK CITY OF NJ0024724 NJ0108758
ADDR: CITY HALL ROOM B331F
: 920 BROAD STREET
CITY: NEWARK
STATE: NJ ZIP: 07102 -

USER DATA:

ENTER - CONTINUE---------- PF-KEYS ----------

1/13 MENU 2/14 3/15 4/16 RETURN 5/17 6/18
7/19 8/20 9/21 EXIT NJPDES 10/22 11/23 12/24

Call Mr Sanjeev Varghese
201 - 256 - 4965
Central Ave
#239
201 312 2370

KLL001370

DATE: 04/06/95 N J P D E S SCREEN: DSSB165B
TIME: 17:00:34 CHANGE FACILITY INFORMATION TERMINAL: #00M

FACILITY EPA NUMBER: EPANJD000557934
D.M.R. MAILING ADDRESS
NAME: _____
ADDRESS: _____
: _____
CITY: _____
STATE: __ ZIP: _____ - ____
ATTENTION: _____
TYPE/OWNER: PUB COUNTY : 07 MUNICIPAL: 14
ENFOR/REG : ME LATITUDE: 40 47 17 LONGITUDE: 74 10 17 SIZE : _
RIVER/BAS : 013309 MAJ/MIN : MA SIG MINOR: _ DPCC : _
IWMF : _ IWMF START DATE: _____ IWMF END DATE: _____
SIC CODE : 4952 ____ ____ ____ ____
LOT-BLOCK: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

ENTER - CONTINUE---------- PF-KEYS ----------
1/13 MENU 2/14 3/15 4/16 RETURN 5/17 6/18
7/19 8/20 9/21 EXIT NJPDES 10/22 11/23 12/24

KLL001371

Newark

Sharpe James
Mayor

Department of Water and Sewer Utilities

Luiggi Campaña
Director

Division of Sewers and Water Supply

Daniel Berardinelli, P.E.
Manager

1294 McBride Avenue
Little Falls, New Jersey 07424
201-256-4965

RECEIVED
MAR [illegible]
Div of W[illegible] Quality
Permit Management

March 20, 1995

Bureau of Permit Management
Division of Water Quality
N J D E P
CN-029
Trenton, NJ 08625-0029

Sub: Request for Authorization-Transmittal of documents

Dear Sir:

Enclosed please find the necessary documents for the Request for Authorization (RFA) for the General CSO permit. This is being submitted as required in Part II of the permit conditions. Necessary advertisement in the newspaper was made and a copy of the same is attached. If you need any additional documents or further clarification on this matter, please contact Mr. Sanjeev Varghese of my office at 201-256-4965.

Very truly yours,

Daniel Berardinelli

Daniel Berardinelli, P.E.
Manager, Div. Sewers & Water Supply.

cc: Luiggi Campana, Director, Water & Sewer Utilities
Alvin Zach, P.E., Department of Engineering.
Sanjeev Varghese, Principal Engineer, Hydraulics.

KLL001372

State of New Jersey
Department of Environmental Protection
Division of Water Quality
Bureau of Permit Management
CN 029
Trenton, New Jersey
08625-029

GENERAL PERMIT NO. NJ0105023
General Permit for Combined Sewer Systems

REQUEST FOR AUTHORIZATION (RFA)

Please read and follow all of the instructions CAREFULLY. Sign, date, and notarize where indicated. PRINT OR TYPE all information.

1. The Facility a. Name (Facility) b. Mailing Address (Number and Street) c. City or Town d. State and Zip Code	CITY OF NEWARK - COMBINED SEWER SYSTEM CITY OF NEWARK COMBINED SEWER SYSTEM ROOM No. B31F, CITY HALL 920 BROAD STRETT NEWARK NEW JERSEY, 07102
2 Authorized Representative a. Name b Number and Street c City or Town d State and Zip Code e. Business Telephone Number	 LUIGGI CAMPANA, DIRECTOR ROOM No. B31F, CITY HALL NEWARK, NJ 07102 (201) 733-6303
3 Facilities and/or Activities to be authorized	a. (YES)(NO) Owner and/or operator of Combined Sewer Collection and/or Conveyance System. b (YES)(NO) Owner and/or operator of a Combined Sewer Overflow Point. c. (YES)(NO) Owner and/or operator of a Combined Sewer Overflow Control Facility. d. (OTHER)
4. EPA Identification Number	NONE
5. a. SIC Code	4592
b. Short Title	SEWARAGE SYSTEM

KLL001373

General Permit No. NJ0105023
for Combined Sewer Systems
Request for Authorization

Please read and follow all of the instructions CAREFULLY (see attached Sheet). Sign and date where indicated. PRINT OR TYPE ALL INFORMATION.

6. a. Owner i. Legal Name	CITY OF NEWARK
ii. Number and Street	920 BROAD STREET, ROOM B31F
iii. City or Town	NEWARK
iv. State and Zip Code	NEW JERSEY, 07102
v. Business Telephone Number	(201) 733-6303
vi. Federal Tax Identification Number of the Owner.	22-6002138
vii. Identification (Mark as appropriate)	( ) Federal Agency ( ) State Agency (XXX) Other Public Agency ( ) Private Entity
6. b. Operator i. Legal Name	CITY OF NEWARK
ii. Number and Street	920 BROAD STREET, ROOM B31F
iii. City or Town	NEWARK
iv. State and Zip Code	NEW JERSEY 07102
v. Business Telephone Number	(201) 733 - 6303
7. Name of the Domestic Treatment Works to which wastewater is conveyed to for treatment.	Name PASSAIC VALLEY SEWERAGE COMMISSION (PVSC) Number & Street 600 WILSON AVE Town or City NEWARK State & Zip Code NEW JERSEY 07105
8. Name of Water Quality Management Planning Agency (N.J.A.C. 7.15-1.5 & 7 5.3 (b)).	Name PASSAIC VALLEY SEWERAGE COMMISSION Number & Street 600 WILSON AVE Town or City NEWARK State & Zip Code NEW JESREY 07102

Printed 01/25/95

KLL001374

ATTACHMENTS

The following information must be provided on separate sheets of paper and accompany the RFA submission:

1. A listing of all permits or construction approvals received or applied for by the applicant at the site under any of the following programs;

a. Hazardous Waste Management program under RCRA;
b. NJPDES permits or treatment works approvals under the State Act or construct and operate permits;
c. Prevention of Significant Deterioration (PSD) Program under the Clean Air Act;
d. Non-attainment program under the Clean Air Act;
e. National Emission Standards for Hazardous Pollutants(NESHAPS) pre-construction approval under the Clean Air Act;
f. Ocean dumping permits under the Marine Protection Research and Sanctuaries Act;
g. Dredge or fill permits under Section 404 of the Federal Act; and
h. Other relevant environmental permits, including Federal permits.

2. Identification of administrative orders, administrative consent orders, notices of violations, complaints filed, or other corrective or enforcement action(s) required by any governmental agencies with regard to the operation of the applicant at that site concerning pollution with the previous five(5) years;

3. For each combined sewer overflow point (CSO Point) provide a schematic diagram showing the configuration of the combined sewer overflow control facilities associated with each CSO Point to the combined sewer system and the combined sewer collection and conveyance system. This diagram should show the relationships of the CSO Point to portion of the combined sewer system where the wastewater is collected, the portion of the combined sewer overflow control facility where the wastewater is diverted from the combined sewer overflow collection and conveyance facilities (i.e., the location of the regulator or other diversion structure), and the CSO Point at which the wastewater is discharged into the receiving water body (i.e., the end of the outfall structure).

4. A copy of the portion of the U.S. Geological Survey Topographic Map, 7.5 minute quadrangle series, showing the location of the facility and the name of the quadrangle(s). Owners and/or operators shall show the following details, as applicable to their facilities/activities, the delineated service area of the collection systems, the alignment of conveyance systems (interceptors, force mains, trunk sewers, etc.), the location and/or alignment of combined sewer overflow control facilities (regulators) and the corresponding combined sewer overflow points (ends of outfalls and other discharge structures).

5. A brief narrative description of the facility(ies) as a combined sewer collection and/or conveyance system, combined sewer overflow point, and/or combined sewer overflow control facility.

6. A photo-copy of the publication of the public notice required under Part II E as it appeared in the publication. Indicate the name and date of the publication, the section, and page number where the public notice appeared.

SUBMISSION

Submit all RFAs to the Bureau of Permits Management, at the address on page 1.

Printed 01/25/95

KLL001375

CITY OF NEWARK
DEPARTMENT OF WATER & SEWER UTILITIES
EXISTING SEWERAGE SYSTEM
NARRATIVE DESCRIPTION

Most of Newark is served by a combined sewer system. Dry weather flows (DWF) are diverted through interceptors to the Passaic Valley Sewage Commissioners (PVSC) Treatment Plant. Twenty primary combined outfalls discharge to the Passaic River and the Airport Peripheral Ditch tributaries excess combined flows from about 10.7 square miles, intermixed separate storm flows from 0.3 square miles, and intermixed separate sanitary flow from 3.4 square miles, including 2.5 square miles located in the City of East Orange. Three relief outfalls provide separate storm drainage for 1.3 square miles downstream of four interconnections that divert excess combined flows from adjacent combined sewers. There are four permitted storm sewers that drain about 0.5 square mile.

Separate sanitary systems tributary to the PVSC serve the northwestern and southeastern portions of the City. Separate sanitary sewage from the City's southwestern corner and Vailsburg section is treated at the Essex-Union Joint Meeting (EUJM) Treatment Plant in Elizabeth.

PVSC Sewage Treatment

All of the City's combined sewer systems are within the PVSC service area. DWF and limited rates of combined sewage in wet weather flows (WWF) are conveyed by intercepting sewers to the PVSC. Plant effluent discharges to New York Harbor. PVSC indicates that Newark contributes about 30 percent of the average 280-300 MGD Plant Flow. About one-third of Newark's 80 to 90 MDG is domestic waste. The remainder consists of industrial wastes, infiltration, tidal intrusion, and combined system inflow.

Interceptors and Metering

Newark's sewage is delivered to the Plant by the PVSC Main Interceptor and its branches, and by the City's Southside Interceptor.

The PVSC Main Interceptor extends northward from the Plant through Newark, Belleville, Nutley, Passaic, Clifton and Paterson, generally paralleling the west bank of the Passaic River. The 30 to 50 ft. deep, 5.8 mile segment through Newark extends

beneath Wilson Avenue, Ferry Street and McCarter Highway. The hydraulic capacity of this segment of the sewer, if clean, ranges from about 200 MGD upstream to 340 MGD downstream, but some capacity is lot due to sedimentation.

Branch interceptors and regulated combined sewer connections enter the Main Interceptor in Newark. PVSC branch interceptor connections include the Kearny-Newark-Harrison (KNH) near Jackson Street, and the Jabez Street near Pulaski Skyway. The Second River Union Outlet Interceptor connects to the Main Interceptor at the Belleville boundary.

Regulated combined flows from northern and downtown Newark are directly intercepted by the Main Interceptor from the following Outfalls: (a) 002 at Verona Avenue, (b) 003 near Delavan Avenue East, (c) 004-005 at Herbert Place, (d) 007-008 at Third Avenue East, (e) 009-010 at Clay Street, (f) 011 at Orange Street, (g) 012 at Bridge Street, (h) 013 near Rector Street, (i) 014 near Saybrook Place, and (j) 015 near City Dock.

Southside Interceptor

The Southside Interceptor extends four miles southwestward from the Plant, south and east of the Conrail corridor, to 1/4 mile north of the City's southern boundary. The sewer was constructed by the City but is leased and maintained by the PVSC. Its diameter ranges from 54 to 84 inches. Depths to invert range from 13 to 25 feet. The Southside Interceptor intercepts regulated combined flows from outfall 025 near the Peddie Ditch, Outfall 026 near International Way, and Outfall 027 near the Busch brewery. It also intercepts separate sanitary flows from Haynes Street industries, Newark Airport and its hotels, Busch brewery, and State Prison. The hydraulic capacity of the clean sewer is about 28 MGD upstream, 49 MGD downstream of Outfalls 026, and 85 MGD downstream of Outfalls 025. However, some of this capacity is lost due to sedimentation.

The Second River Union Outlet

The 54-inch PVSC Second River Union Outlet interceptor enters the Main Interceptor in McCarter Highway south of the Belleville boundary. The separate sanitary interceptor follows the banks of the Second River and services the separate systems in northwesten Newark, and portions of Belleville, Bloomfield, East Orange, Glen Ridge, Montclair and Orange. The Union Outlet connection is provided with a 48-inch overflow that discharges to the Passaic River in Newark about 150 feet north or Outfall

022. During periods of heavy rain and Main Interceptor surcharge, the PVSC may shut the interceptor connection gate and allow all sanitary flow to overflow. Although the Union Outlet overflow is within Newark, it is under the jurisdiction of the PVSC.

Collection System

There are about 300 miles of sewers in Newark's collection system that are tributary to the PVSC system, excluding building connections. Most of Newark's trunk and collection system was constructed in the nineteenth century. The combined sewer diameters range from 8 to 12 inches at the extremities to more than ten feet at some of the larger outfalls.

With the construction of the PVSC Treatment Plant and interceptors, PVSC regulators diverted a regulated maximum rate of sewage into the interceptors at the locations where each combined seer outfall passed over the interceptor, allowing rates in excess o the intercepted flow to discharge to the waterway. Subsequently, separate storm systems and sanitary sewers have been installed in newly developed areas, and in portions of areas once served by the combined system.

In response to internal flooding caused by lack of combined sewer capacity, the City constructed relief storm sewers that allow the surcharged combined sewer t overflow into the relief sewer.

The average dry weather sanitary flow rate in Newark equals the runoff from 0.02 to 0.05 in/hr. of rainfall runoff. The City's combined sewers have capacities to convey from 0.80 to 2.00 in/hr. of rainfall runoff, many times that needed to convey peak sanitary flows. Newark's largest combined trunks have twice the capacity of the Main Interceptor. At each point of combined sewage interception, it is necessary to limit the rate of flow entering the interceptor with a regulator. Combined sewage in excess of interception capacity overflows a diversion dam and discharges to the waterway. Where the DWF diversion dam crest is below the Spring high tide elevation, tide gates are provided on the outfall to prevent the interception of waterway flow.

The PVSC maintains ten major and five minor CSO regulators on the combined Newark sewers entering their interceptors. The major regulators control interception from Outfalls (a) 002, (b) 004-005, (c) 008, (d) 009-010, (e) 013, (f) 014, (g) 015, (h) 016, (i) 017, and (j) 018. The minor regulators control interception from Outfalls (a) 003, a second regulator downstream of the primary, (b) 007, (c) 009b in Passaic Street that discharges to Outfall 009, (d) 011 and (e) 012. The intercepted flows are limited

by the capacities of vertical orifices and downstream interconnecting piping. At PVSC's ten major regulators, flow interception can be shut off with remote operated sluice gates on the downstream face of the orifice.

The City constructed nine presently active regulators, intercepting flow from seven combined sewer Outfalls, (a) 003 upstream, (b) 022, (c), 023, (2), (d) 024-030, (e) 025 (2), (f) 026, and (g) 027-029.

Due to maintenance problems and obsolescence, all float operated gates originally installed, except that upstream of Waverly Ditch Outfall 027-029, have been abandoned or removed. The rates of interception are now controlled by fixed orifices and knife gates.

When the Plant flow approaches 480 MGD, the PVSC operator closes the gates at one or more of the pints of interception until plant flow stabilizes at 480 MGD. The gates are reopened after the rain has ended. The sequencing is based on the operator's assessment of the amount of throttling required for the specific rainfall. There are provisions for manual operation of the gates if the telemetry fails.

The City installed a knife gate on the regulator on Outfall 022. The normally open knife gate on the DWF connection shuts when the adjacent storage module flapgate opens to discharge stored combined sewage to the Passaic River.

When the sluice gates on the ten regulator orifices or the Union Outlet connection is closed, all tributary subsystem flows are diverted to the Passaic River untreated via the CSO outfall. When the gate on the Southside Interceptor is closed, the Interceptor surcharges about 10 to 15 feet. The surcharge backs up al the non-regulated tributary flows that discharge with the regulated flow through the Peddie and Waverly overflows into the tidal ditches. The surcharging of the Southside Interceptor could possibly flood low-lying tributary connections.

Several of the original combined sewers had insufficient capacity to prevent upstream flooding. Accordingly, the City installed interconnections that permit surcharged combined sewers to overflow into adjacent combined sewers or storm relief sewers. Interconnections with upstream combined system divert surcharged combined flow through the Meadowbrook outfall 001 to the Second River, and through Outfalls 003 and 006 to the Passaic River. (Outfall 003 is partially intercepted, but separate channels in the upstream regulator prevent the interception of the relief flow.)

The City has participated in CSO pollution control demonstration projects for in-line storage floatable netting.

As part of a CSO abatement program for the Ironbound section, Newark, installed, in 1982 demonstration storage module regulator at Roanoke Avenue Outfall 022 to utilize available storage capacity in a large flat tributary combined trunk. Generally the tributary sewer can sore between 0.50 and 0.10 inches of tributary rainfall runoff. The module contains a hydraulically operated flapgate across the outfall and the knife gate on the orifice regulated DWF diversion. Interception is provided while the in-line capacity is filling. When filled, the flapgate opens, rapidly discharging all stored combined sewage, and the knife gate shuts, ceasing interception until the flap gate shuts.
As part of a 1991 USEPA demonstration grant, pontoon-mounted netting systems are installed to intercept CSO floatable 1/2 inch or larger at Saybrook Place, Outfall 014, and Peddie Ditch, Outfall 025.

Outfalls with CSO Permits

Newark's 30 permitted outfalls have been classified herein as follows: (1) 21 (17 excluding the second of twin-barrel outlets) as major primary, (2) three as minor primary, (3) two as completely unintercepted relief, and (4) four as unintercepted separate storm. Major primary outfalls drain more than 50 acres and overflow when the capacity of the regulated interception connection is exceeded. Minor primary outfalls operate similarly but have drainage areas less than 15 acres. Relief outfalls discharge CSO only when the upstream flow levels in adjacent combined sewers rise to the level of interconnections between the combined and relief system. Separate storm outfalls with CSO Permits have no legitimate sanitary connections but may have (1) served as a CSO outfall prior to sewer separation, (2) connected illicit sanitary connections, or (3) drainage from polluted surface flows.

CITY OF NEWARK

GENERAL PERMIT # NJ0105023
Request for Authorization

Form A: Schedule of Combined Sewer Overflow Points

No.	Name/Number	Latitude	Longitude	Regulator Owned By	Name Receiving Waterbody	Remarks
1	Meadowbrook	40° 47' 17"	74° 10' 17"	Newark	Second River	Storm Relief Sewer
2	Verona	40° 46' 07"	74° 09' 06"	PVSC	Passaic River	Major Outfall
3	Delavan Ave	40° 46' 07"	74° 09' 27"	PVSC	Passaic River	Minor Outfall
004/005	Herbert Pl	40° 45' 57"	74° 09' 34"	PVSC	Passaic River	Major Outfall (Double Barrel)
6	Oriental	40° 45' 34"	74° 09' 53"	Newark	Passaic River	Storm Relief Sewer
7	Third Ave	40° 45' 28"	74° 09' 55"	PVSC	Passaic River	Minor Outfall
8	Fourth Ave	40° 45' 22"	74° 09' 56"	PVSC	Passaic River	Major Outfall
009/010	Clay St	40° 45' 03"	74° 09' 58"	PVSC	Passaic River	Major Outfall (Double Barrel)
11	Orange St	40° 44' 47"	74° 10' 01"	PVSC	Passaic River	Minor Outfall
12	Bridge St	40° 44' 42"	74° 10' 01"	PVSC	Passaic River	Minor Outfall
13	Rector St	40° 44' 29"	74° 09' 56"	PVSC	Passaic River	Major Outfall
14	Saybrook Pl	40° 44' 26"	74° 09 54"	PVSC	Passaic River	Major Outfall Netting Trashtrap in place
15	City Dock	40° 44' 07"	74° 09' 45"	PVSC	Passaic River	Major Outfall
16	Jackson St	40° 43' 59"	74° 09' 19"	PVSC	Passaic River	Major Outfall
17	Polk St	40° 43' 58"	74° 09' 10"	PVSC	Passaic River	Major Outfall
18	Freeman Ave	40° 44' 03"	74° 08' 46"	PVSC	Passaic River	Major Outfall
19	Brown St	40° 44' 26"	74° 08' 19"	Newark	Passaic River	Separate Storm Outfall

KLL0013 81

No.	Name/Number	Latitude	Longitude	Regulator Owned By	Name Receiving Waterbody	Remarks
20	Lockwood	40° 44' 30"	74° 07' 53"	Newark	Passaic River	Separate Storm Outfall
21	Blanchard St	40° 44' 30"	74° 07' 40"	Newark	Passaic River	Separate Storm Outfall
22	Roanake Ave	40° 43' 34"	74° 07' 17"	Newark	Passaic River	Major Outfall
23	Adams St	40° 42' 42"	74° 10' 12"	Newark	Peripheral Ditch	Major Outfall
024/030	Wheeler/ Ave A	40° 42 49"	74° 10' 47"	Newark	Peripheral Ditch	Outfall (Double Barrel)
25	Peddie St	40° 42' 36"	74° 11' 06"	PVSC	Peripheral Ditch	Major Outfall Netting Trashtrap in place
26	Queen	40° 42' 20"	74° 11' 12"	PVSC	-	Outfall pipe is collapsed and plugged
027/029	Waverly	40° 41' 25"	74° 11' 26'	PVSC	Peripheral Ditch	Outfall (Double Barrel)
28	Haynes Ave	40° 42' 23"	74° 11' 00"	Newark	Peripheral Ditch	Separate Storm Outfall

KLL001382

TRLN100544

Resolution of the City of Newark, N. J.

NO. TRCN

Date of Adoption OCT. 05 1994

Resolution authorizing Director of Department of Water and Sewer Utilities to sign and submit request for Authorization for General New Jersey Pollutant Discharge Elimination System Permit, for Combined Sewer Overflows)

Approved as to Form and Legality on Basis of Facts Set Forth

Michelle Hallacher
Corporation Counsel

Factual contents certified by

Director
Title

Council Member Council of the Whole presents the following Resolution:

WHEREAS, the New Jersey Department of Environmental Protection has issued a draft general permit number NJ0105023 for the City of Newark's Combined Sewer Overflows under the New Jersey Pollutant Discharge Elimination System; and

WHEREAS, to obtain authorization under this permit the City of Newark is required to submit a complete Request For Authorization in accordance with the requirement of part II of this permit;

WHEREAS, the Request For Authorization has to be signed by an authorized representative of the City of Newark;

NOW, THEREFORE, BE IT RESOLVED BY THE MUNICIPAL COUNCIL OF THE CITY OF NEWARK, NEW JERSEY THAT:

1. The Director of Department of Water and Sewer Utilities is hereby authorized on behalf of the City of Newark to sign and submit the Request For Authorization to the New Jersey Department of Environmental Protection.

   A copy of the Draft General Permit is herewith attached.

STATEMENT

This Resolution authorizes the Director of Department of Water and Sewer Utilities to sign and submit the Request For Authorization for the General New Jersey Pollutant Discharge Elimination System permit.

CERTIFIED TO BY ME THIS
12th DAY OF OCTOBER, 1994

Do not use space below this line

RECORD OF COUNCIL VOTE ON FINAL PASSAGE

Council Member	AYE	NAY	NV	AB	Council Member	AYE	NAY	NV	AB	Council Member	AYE	NAY	NV	AB
BRANCH	✓				HARRIS	✓				RICE	✓			
CARRINO	✓				MARTINEZ	✓				TUCKER	✓			
CRUMP	✓				QUINTANA	✓				BRADLEY, Pres.	✓			

✓ - Indicates Vote AB - Absent NV - Not Voting

Adopted at a meeting of the Municipal Council of the City of Newark, N.J. OCT. 05 1994

Donald Bradley
President of the Council

City Clerk

This Resolution adopted must remain in the custody of the City Clerk. Certified copies are available.

KLL001383

LEGAL NOTICES

6-F-1 AN ORDINANCE AMENDING ORDINANCE 6S & FC ADOPTED MARCH 16, 1994, AUTHORIZING THE DEPARTMENT OF DEVELOPMENT TO LEASE CITY-OWNED PROPERTY LOCATED AT 45-55 PENNSYLVANIA AVENUE (BLOCK 2822, LOTS 4,5 & 8) TO SAINT COLUMBA SCHOOL FOR RECREATIONAL PURPOSES ONLY, PURSUANT TO N.J.S.A. 40A:12-14(c) and N.J.S.A. 40A 12-15

WHEREAS, said lots were erroneously listed as Lots 4,6 & 8 in Block 2822 having an address of 46-66 Pennsylvania Avenue and 34 Thomas Street,

NOW THEREFORE BE IT ORDAINED BY THE MUNICIPAL COUNCIL OF THE CITY OF NEWARK, NEW JERSEY, THAT

1. The correct lot designation should read Lots 4,5 & 8 in Block 2822 (45-55 Pennsylvania Avenue)

2 The City-owned parcels known as Block 2822, Lots 4,5 & 8 (45-55 Pennsylvania Avenue) shall be leased to Saint Columba School for recreational purposes only

3 All other matters pertinent to Ordinance 6S & FC 031694 shall remain in force and effect

4 This Ordinance shall take effect upon publication

STATEMENT

Passage of this ordinance will permit the City of Newark to lease lands not need for public purposes to Saint Columba School for recreational purposes only.

PUBLIC NOTICE IS HEREBY given that the foregoing ordinance was introduced and passed on first reading at a regular meeting of the Municipal Council of the City of Newark, New Jersey, held on the 1st day of March, 1995 and that said ordinance will be taken up for further consideration for final passage at the meeting of the Municipal Council to be held in the Council Chamber, 2nd Floor, Newark, New Jersey, on the 15th day of March, 1995, at 7:00 P.M., or as soon thereafter as said matter can be reached, at which time and place all persons who may be interested therein will be given an opportunity to be heard concerning the same

Robert P. Marasco
City Clerk
Newark, New Jersey

Publish March 7, 1995 $81.00

F-1 AN ORDINANCE RATIFYING AND AUTHORIZING THE EXECUTION OF A LEASE AGREEMENT BETWEEN THE REDEEMER LUTHERAN CHURCH, LANDLORD, AND THE CITY OF NEWARK, TENANT, FOR THE LEASING OF THE PREMISES COMMONLY KNOWN AS 664 BROADWAY, BLOCK 731, LOT 1, FOR THE SUM OF $15,420.00 PER YEAR FOR A PERIOD OF TWELVE (12) MONTHS

WHEREAS, the premises commonly known as 664 Broadway, Block 731, Lot 1, on the Official Tax Maps and Tax Duplicate (year 1993) of the City of Newark, New Jersey, is needed for a public purpose, and

WHEREAS, the City of Newark, Tenant, and the Redeemer Lutheran Church, Landlord, desire to enter into a lease agreement for the premises, commonly known as 664 Broadway, Block 731, Lot 1, for a period beginning May 1, 1994 and ending April 30, 1995 for the sum of $15,420.00

NOW, THEREFORE, BE IT ORDAINED BY THE MUNICIPAL COUNCIL OF THE CITY OF NEWARK, NEW JERSEY, THAT

Section 1 The Business Administrator of the City of Newark is hereby authorized to enter into the lease agreement, on behalf of the City of Newark, Tenant, with the Redeemer Lutheran Church, Landlord, for the leasing of the premises, commonly known as 664 Broadway, Block 731, Lot 1, pursuant N.J.S.A. 40A 12 15, for the period of May 1, 1994 through April 30, 1995

Section 2 The Municipal Council of the City of Newark hereby ratifies the lease agreement between the City of Newark, Tenant, and the Redeemer Lutheran Church, Landlord, for the leasing of the premises, commonly known as 664 Broadway, Block 731, Lot 1, for the period beginning May 1, 1994 to the adoption of this Ordinance

Section 3 The City of Newark shall, as a consideration for said lease agreement, pay the owner the sum of $15,420.00 in equal monthly installments of $1,285.00, for the term of the lease, beginning May 1, 1994 and ending April 30, 1995

Section 4 A copy of the lease agreement is attached hereto and made part hereof

Section 5 A copy of this lease agreement and this Ordinance shall be permanently filed in the Office of the City Clerk by the Business Administrator

Section 6 This Ordinance shall take effect upon final passage and publication in accordance with the laws of the State of New Jersey

Section 7 Attached hereto is a Certification from the Municipal Comptroller in the amount $15,420.00

STATEMENT

Passage of this ordinance will ratify and authorize a lease agreement between the City of Newark, Tenant, and the Redeemer Lutheran Church, Landlord, for utilization of 664 Broadway as the North Newark Senior Citizen Center. The period of the lease agreement will be from May 1, 1994 through April 30, 1995 and the total consideration for said period shall be $15,420.00

PUBLIC NOTICE IS HEREBY given that the foregoing ordinance was introduced and passed on first

Zindler, 3131 Princeton Pike, Lawrenceville, New Jersey 08648, telephone 609-896-2414, no later than April 3, 1995

Dated: February 27, 1995

MARKOWITZ AND ZINDLER
Attorneys for Trustee
By: Richard J. Kwasny

Publish: March 7, 1995 $82.50

NOTICE OF AWARD
BY THE
RAHWAY VALLEY SEWERAGE AUTHORITY

Contractor: Jacobs Environmental, Inc.
120 Centennial Avenue
Piscataway, NJ 08854

Nature of Contract: Contract #9519, 1994 Emissions Statement

Amount of Contract: Not to Exceed $3,500.00

Duration of Contract: 2/23/96

A copy of the contract is available for inspection at the office of the Secretary-Treasurer of the Authority

Richard P. Gonder,
Secretary-Treasurer

Runs 3/7/95 $28.50

NOTICE OF PUBLIC HEARING AND
PUBLIC COMMENT PERIOD

Take notice that the Department of Environmental Protection (NJDEP) will propose new rules and amendments to the solid waste management rules at N.J.A.C. 7:26. This proposal would allow licensed solid waste transporters to operate intermodal container facilities's where sealed solid waste containers can be moved from one mode of transportation to another (e.g., from truck to rail), or between vehicles using the same mode of transportation. The rule proposes a new streamlined solid waste planning and facility authorization process as opposed to historical permitting of these operations as "transfer stations." The proposed rules will be published in the New Jersey Register on March 6, 1995. A public hearing concerning this proposal will be held on

Wednesday, March 22, 1995 beginning at 10:00 A.M.
Public Hearing Room, First Floor
New Jersey Department of Environmental Protection
401 East State Street
Trenton, New Jersey 08625

Interested parties can give testimony on March 22 or submit written comments by April 5, 1995 to

Janis E. Hoagland, Esq.
Attn: DEP Docket Number 01-95 02/507
Office of Legal Affairs
New Jersey Department of Environmental Protection
CN 402
Trenton, New Jersey 08625-0402

Copies of the proposed rule may be obtained by writing to the NJDEP's Division of Solid and Hazardous Waste, Bureau of Medical Waste and Technical Assistance, 840 Bear Tavern Road, CN414, Trenton, New Jersey 08625-0414 or calling the NJDEP at (609) 530-8599 $58.50

NOTICE

SUMMIT BANK, 367 Springfield Avenue, Summit, New Jersey, 07901, has available for public viewing the 1994 home mortgage lending data in accordance with the New Jersey Department of Banking Anti-Redlining Regulation. This statement is available at six branch offices of Summit Bank. Anyone wishing to see this statement or obtain a copy of it should contact the branch manager at the above address or one of the following locations

135 Jefferson Avenue
Elizabeth, New Jersey
800 Inman Avenue
Colonia, New Jersey
501 Arnold Avenue
Point Pleasant Beach, New Jersey
16 Nassau Street
Princeton, New Jersey
387 Memorial Parkway
Phillipsburg, New Jersey

$37.50

O. GENE HURST, ESQ.
1088 Raritan Road
Clark, New Jersey 07066
(908) 382-6748

SUPERIOR COURT OF NEW JERSEY
CHANCERY DIVISION ESSEX COUNTY
DOCKET NO. F-14932-93
CIVIL ACTION
ORDER SETTING TIME, PLACE AND AMOUNT OF REDEMPTION FOR COMPLAINT IN FORECLOSURE OF CERTIFICATE OF TAX SALE

BARRY D. POTE,
Plaintiff,
vs
MESSIAH UNIVERSAL SPIRITUAL TEMPLE, INC., STATE OF NEW JERSEY, ESSEX COUNTY, INTERNAL REVENUE SERVICE, TOWNSHIP OF MONTCLAIR, THE UNION AMERICAN METHODIST EPISCOPAL CHURCH, INC., EBRAHIM FARAJI, ROBERT

Plaintiff's tax sale certificate in accordance with the terms of this order.

Samuel D. Lenox, Jr., J.S.C.

Publish: March 7, 1995 $210.00

PUBLIC ANNOUNCEMENT

Pursuant to the "Open Public Meetings Act", Public Law 1975, Chapter 231, notice is hereby given that a meeting of the State Council on Vocational Education and the Occupational Education Task Force will be held on Tuesday, March 14, 1995, 8:30 a.m., Middlesex County Vocational Technical School, 112 Rues Lane, East Brunswick, New Jersey. $12.00

PUBLIC NOTICE
CITY OF NEWARK, NEW JERSEY,

A Request For Authorization under General NJPDES Permit No. NJ 0105023 has been submitted to the New Jersey Department of Environmental Protection for the Combined Sewer Overflows owned by the City of Newark, pursuant to N.J.A.C. 7:14A-3.9(b)2. The Combined Sewer Overflows discharge combined sewage into the waters of the Second River, the Passaic River, and the Peripheral Ditch in Newark.

Division of Sewers & Water Supply
1294 McBride Avenue
Little Falls, NJ 07424

$25.50

Public Notice of hearing of an application to the Board of Adjustment of the City of Newark, N.J.

Calendar No: 6-95-B
Premises: 44 Lanark Avenue
Applicant: Gustavous Thomas, Owner
To Permit: in a 2nd Residential Zone, legalization of an existing attic apartment (studio), with insufficient on-site parking and one insufficient side yard.
Date of Hearing: March 22, 1995 at 7 p.m.
Hearing to be held in Council Chambers, City Hall, Newark, New Jersey $21.00

PUBLIC NOTICE
OF HEARING AN APPLICATION
TO THE
CENTRAL PLANNING BOARD,
CITY OF NEWARK, N.J.

APPLICATION: SP1-295/ V1-295
APPLICANT'S NAME: Leona Camba
APPLICANT'S ADDRESS: 65 Garfield Ave., West Orange
PREMISES: 139 Wilson Ave., Newark
TO PERMIT: A SITE PLAN/ VARIANCE REVIEW
Two story rear addition interior alteration to an existing building to be used as one store & two apartments seeking variances for insufficient front yard & no on-site parking. Total 3420 sq f a
DATE OF HEARING: 3-20-95
TIME OF HEARING: 6:00 P.M.
HEARING TO BE HELD IN:
MUNICIPAL COUNCIL CHAMBER
920 BROAD STREET,
CITY HALL-2ND FLOOR
NEWARK, N.J. 07102 $40.50

PUBLIC NOTICE

THE GOVERNING BODY OF REGION ONE HEALTH PLANNING ADVISORY BOARD, INC. - A NOT-FOR-PROFIT HEALTH PLANNING ORGANIZATION - WILL CONDUCT ITS REGULARLY SCHEDULED MEETINGS FOR 1995 ON THE FOLLOWING DATES: MARCH 23, APRIL 27, MAY 25, JUNE 22, JULY 27, AUGUST 24, SEPTEMBER 28, OCTOBER 26, NOVEMBER 16, DECEMBER 28 COMMENCING AT 5:00 PM IN ITS CORPORATE OFFICES, LOCATED AT 5 EMERY AVENUE, RANDOLPH, NJ 07869-1368. REGION ONE HEALTH PLANNING ADVISORY BOARD, INC. RESEARCHES AND PLANS HEALTH SERVICES IN PASSAIC, MORRIS, SUSSEX, AND WARREN COUNTIES. THE RESULT OF ITS PROFESSIONAL PROGRAM, INCLUDING ANALYSIS OF CERTIFICATE OF NEED APPLICATIONS FOR HEALTH SERVICE PROJECTS, ARE USED TO ADVISE THE NEW JERSEY DEPARTMENT OF HEALTH AND THE STATE HEALTH PLANNING BOARD AS THEY CONSIDER HEALTH PROJECTS DEVELOPMENT OF THE STATE HEALTH PLAN. FOR MORE INFORMATION CONTACT DENISE SHERMAN AT 201-361-3390. ALL ARE WELCOME!

ROBERT J. SCHERMER
EXECUTIVE DIRECTOR $46.50

PUBLIC NOTICE

The U.S. Department of Housing and Urban Development (HUD) is providing modernization funding on a formula basis to Housing Authorities throughout the United States to help improve the physical conditions and upgrade the management and operation of existing public housing. This funding will be through the new Comprehensive Grant Program (CGP) which replaces the Comprehensive Improvement Assistance Program (CIAP).

To receive this funding, the Housing Authority is developing a Comprehensive Plan, in consultation with residents, local government and other interested parties. Key elements of the Plan include: Five-year Action Plan; Local Government Statement; PHA Board Resolution; and Annual Statement. The Comprehensive Plan must be submitted to the HUD Newark Office by June 15, 1995.

The Housing Authority of the City of Newark will be holding a Public Hearing on Monday, March 13

MUSIC IN J

Works c reintrod

Summit Chorale, Gar missions." Works by son; premiere by Joh music by Festa, Senfl rangements by Shaw Saturday in the Middle

By PAUL SOMERS

Garyth Nair can be proud comes to the number and q works commissioned by the Chorale. In putting together bration of this endeavor Nai ered the chorale had generate music to fill an entire con merely the first half he was The few chosen represented wide-ranging styles of New Je posers and the chorale's capat

It was only right that a should be part of the celebrat Kaefer of Basking Ridge is t est composer to be given a co by the Summit Chorale. Tho only 18 years old his connecti Whitman text "Come Lo Soothing Death" was appa clearly understood how to fin the vocal colors in each ran *cappella* music was tonal wit dering, filled with craft witho ing academic, and at all tin emotional. Bravo to Kaefer, the chorale.

Plainfield's Carl Della P best served by the look back. the singers understood his score of "O Magnum Myste better than in 1985, and t lightly. Just as importantly, t tic this time was gracious e allow the lines to stand out.

The women's choir alw

Pop ens
KLLC01384

Triad Arts Ensemble. Variations. Music

GENERAL PERMIT NJ0105023
ATTACHMENT A:
RFA CERTIFICATION

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this Request for Authorization (RFA) and all attached documents, and that this RFA and all attached documents were prepared by personnel under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon my personal knowledge and/or my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil and criminal penalties for submitting false, inaccurate or incomplete information, including the possibility of fine and/or imprisonment."

"I also certify that I have made arrangements for publication, in a daily or weekly newspaper within the area affected by the facility identified in this RFA, of a notice which states that a request for authorization under General Permit No. NJ0105023 for Combined Sewer Systems has been submitted pursuant to N.J.A.C. 7:14A-3.9 (b) 2. This notice identifies the general permit number, the legal name, and address of the owner and/or operator, the facility name and address, and the type of facilities, and the receiving surface water(s)."

Name of Newspaper: STAR LEDGER

Date of publication: 03 / 07 /1995

"I am aware that, pursuant to the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., there are significant civil and criminal penalties for making a false statement, representation or certification in any application, record, or other document filed or required to be maintained under the Act, including fines and/or imprisonment."

OWNER'S CERTIFICATION

CORPORATION:(vice president or higher)

_____ (signature) _____ (print name)
__/__/__ (date)

PARTNERSHIP OR SOLE PROPRIETORSHIP
(general partner or proprietor)

_____ (signature) _____ (print name)
__/__/__ (date)

GOVERNMENT OR PUBLIC AGENCY
(principal executive officer or ranking elected official)

[signature] LUIGGI CAMPANA (signature) (print name)
3/17/95 (date)

OPERATOR'S CERTIFICATION

CORPORATION:(vice president or higher)

_____ (signature) _____ (print name)
__/__/__ (date)

PARTNERSHIP OR SOLE PROPRIETORSHIP
(general partner or proprietor)

_____ (signature) _____ (print name)
__/__/__ (date)

GOVERNMENT OR PUBLIC AGENCY
(principal executive officer or ranking elected official)

[signature] LUIGGI CAMPANA (signature) (print name)
3/17/95 (date)

GENERAL PERMIT NJ0105023

ATTACHMENT D

TRANSMITTED DOCUMENT CERTIFICATION

"I certify under penalty of law that I have personally examined and am familiar with the information submitted with this transmittal and all attached documents, which are individually listed (or described) on this Transmitted Document Certification, and that this transmittal and all attached documents were prepared by personnel under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my personal knowledge and/or my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant civil and criminal penalties for submitting false, inaccurate, or incomplete information, including the possibility of fine and/or imprisonment." (See N.J.A.C. 7:14A-2.4(b)5.i.)

OWNER'S CERTIFICATION

CORPORATION (vice president or higher)

_____ (signature) _____ (print name)

__/__/__ (date)

PARTNERSHIP OR SOLE PROPRIETORSHIP (general partner or proprietor)

_____ (signature) _____ (print name)

__/__/__ (date)

GOVERNMENT OR PUBLIC AGENCY (principal executive officer or ranking elected official)

[signature] LUIGGI CAMPANA (signature) (print name)

3/17/95 (date)

OPERATOR'S CERTIFICATION

CORPORATION (vice president or higher)

_____ (signature) _____ (print name)

__/__/__ (date)

PARTNERSHIP OR SOLE PROPRIETORSHIP (general partner or proprietor)

_____ (signature) _____ (print name)

__/__/__ (date)

GOVERNMENT OR PUBLIC AGENCY (principal executive officer or ranking elected official)

[signature] LUIGGI CAMPANA (signature) (print name)

3/17/95 (date)

Name of Permittee: _____

Authorization Number: _____

KLL001386

GENERAL PERMIT NJ0105023

ATTACHMENT E

AUTHORIZED REPRESENTATIVE CERTIFICATION

(OPTIONAL)

I, the owner and/or I, the operator authorize the below named person to act as our agent/ representative in all matters that pertain to our Request for Authorization, and/or for administrative actions relative to complying with the requirements as they apply to our facilities authorized under the NJPDES General Permit No. NJ0105023.

The name and address of the Agent/Authorized Representative is:

NAME: DANIEL BERARDINELLI, P.E., MANAGER

ADDRESS: 1294 McBRIDE AVENUE

CITY/TOWN: LITTLE FALLS

STATE & ZIP CODE: NJ 07424

OWNER'S CERTIFICATION
CORPORATION:(vice president or higher)

_____ (signature) _____ (print name)
__/__/__ (date)

PARTNERSHIP OR SOLE PROPRIETORSHIP
(general partner or proprietor)

_____ (signature) _____ (print name)
__/__/__ (date)

GOVERNMENT OR PUBLIC AGENCY
(principal executive officer or ranking elected official)

[signature] LUIGGI CAMPANA
(signature) (print name)
3/17/95 (date)

OPERATOR'S CERTIFICATION
CORPORATION:(vice president or higher)

_____ (signature) _____ (print name)
__/__/__ (date)

PARTNERSHIP OR SOLE PROPRIETORSHIP
(general partner or proprietor)

_____ (signature) _____ (print name)
__/__/__ (date)

GOVERNMENT OR PUBLIC AGENCY
(principal executive officer or ranking elected official)

[signature] LUIGGI CAMPANA
(signature) (print name)
3/17/95 (date)

(Only one person need sign when the owner and operator are the same. Both parties must sign when owner and operator are separate and distinct.)

I, the undersigned, agree to serve as agent/authorized representative for the above listed owner and /or operator.

[signature]
(Signature of Agent/Authorized Representative)

Name of Permittee: _____

Authorization Number: _____

E PRINTED ON 01/25/95

KLL001387

EDWARDS AND KELCEY

MEMORANDUM

Engineers
Planners
Consultants

Date: February 20,1996

To: File

By: Frank Huber

RECEIVED

FEB 26 1996

Div of Water Quality
Bureau of Water
Quality Analysis

Subject: Route 21, Section 2M
Utility Relocations
PVSC Combined Sewer Regulators

A meeting was held in the office of Edwards and Kelcey at 299 Madison Avenue, Morristown New Jersey on Tuesday, February 20, 1996 with representatives the City of Newark and the Passaic Valley Sewerage Commissioners (PVSC) to discuss the potential relocation of existing regulator chambers. In attendance were:

Ed Tideman	PVSC
Sanjeev Varghese	City of Newark
Frank Huber	EK
Walter Lawrence	EK
Chris Karakos	EK

The revised roadway alignment that provides the desired corridor between the roadway and the performing arts center for installation of the Newark Elizabeth Rail Link and utilities places portions of the northbound roadway over the existing PVSC regulator chambers. These regulators are located east of the existing roadway near Saybrook Place and south of Rector Street. They will be referred to as the Saybrook Place and Rector Street regulator respectively. It was noted that the regulators and the connection pipe to the interceptor sewer are owned and operated by PVSC. The combined sewer that delivers the discharge to the regulators and the overflow pipe that conveys the excess runoff to the Passaic River are owned and operated by the city of Newark.

PVSC provided plans and profiles of the sewer alignment in the vicinity of the regulators and details of the regulators. The regulator includes a siltation chamber at the upstream end. Dry weather flow is diverted to the interceptor through a flume. The opening of the flume is fitted with a sluice gate that is electrically operated from the treatment plant. Flow to the regulator can be regulated or totally eliminated to avoid surcharging the treatment plant. The excess runoff that does not enter the interceptor through the flume is bypassed to the Passaic River. It was noted that all of the dry weather flow enters the interceptor. Reduction in the amount of flow that is allowed to enter the interceptor occurs when monitoring of flows in the interceptor indicates the need for a reduction to avoid surcharging at the treatment plant.

PVSC indicated that routine maintenance of the regulators includes frequent removal of material from the siltation chamber, typically on a weekly basis, and periodic maintenance of the sluice gate mechanism. The resultant significant disruption on traffic can be avoided by relocating the regulators outside the roadway pavement. The City of Newark has recently installed a floatable containment system at the outlet end of the overflow pipe from the

Saybrook regulator. The City ultimately intends to connect the overflow pipe from the Rector Street regulator to this floatable containment system.

It was agreed that the best approach to relocating the existing regulators would probably be to provide one regulator, located east along the line of the existing overflow pipe from the Saybrook Place regulator, extend the Rector Street sewer to the new regulator at Saybrook Place, and eliminate the existing Rector Street regulator. An additional overflow pipe and modification of the existing floatable containment facility would be required to accommodate the additional flow. The combined sewers from Saybrook Place, Rector Street and Centre Street should enter a junction chamber immediately upstream of the new regulator with one connection to convey the entire discharge provided to the regulator.

The City of Newark indicated that a portion of the existing overflow pipe from the Rector Street Sewer has collapsed and needs to be repaired immediately. This repair, which is estimated to cost $100,000, will be abandoned when the proposed regulator relocation is implemented. The City suggested an alternative to repairing the collapsed overflow pipe In its current location. The alternative would include installation of a new overflow pipe from the Rector Street regulator to the existing floatable containment facility. The alignment would be set approximately parallel to the existing connection between the regulators to allow using this pipe to extend the Rector Street sewer to the new regulator. The City asked if NJDOT could ultimately reimburse them for this installation when the Route 21 project is constructed. EK agreed to present this request to NJDOT.

Both the City of Newark and PVSC indicated that they are not available to prepare the design and construction documents required for the regulator relocation. They asked EK to prepare the construction documents and incorporate them in the documents for the Route 21 construction project. EK responded that guidance regarding primarily the design of the regulator chamber will be required from PVSC to be sure that the design satisfies their requirements. PVSC indicated that the regulator should be similar to the existing regulator at Saybrook Place, modified to accommodate the increased flow from the Rector Street sewer. Both the City of Newark and PVSC agreed to work closely with EK and provide the necessary guidance as the design progresses.

It was noted that the City of Newark is currently conducting an extensive hydraulic evaluation of the entire sewer system. The peak discharges in the pipes that connect to the Rector Street and Saybrook Place regulators will be supplied to EK. It was noted that the regulator design, including the associated pipe relocations, must be approved by NJDEP. Studies previously performed for the City of Newark indicated that the velocity at the Saybrook regulator are adequate to warrant installation of a vortex separator for the regulator. However, initial discussion between the City of Newark and NJDEP revealed that the vortex separator would not be acceptable at this location. Coordination with NJDEP during the design is crucial.

PVSC also indicated that major PVSC facilities are located in the Clay Street intersection with Route 21. A multitude of sewer chambers and yield a significant number of manhole covers in the intersection. Major reconstruction of the sewer system may be required to eliminate manholes from the roadway.

In conclusion, it was agreed that EK would prepare the required construction documents for the regulator relocation with technical guidance provided by the City of Newark and PVSC. The regulator will be similar to the standard currently in use by PVSC. Alternative regulator designs, such as vortex separators, will not be considered. EK will develop a relocation scheme for discussion with the City of Newark and PVSC prior to meeting with NJDEP to obtain their guidance.

cc: Attendees
R. Laube (NJDOT -Region 2)
R. Brenfleck (NJDOT-Utilities)
D. Zeppenfeld (NJDEP-Bureau of Water Quality Analysis)

Newark

Sharpe James
Mayor

Department of Water and Sewer Utilities

Luiggi Campaña
Director

Division of Sewers and Water Supply

Daniel Berardinelli, P.E.
Manager

1294 McBride Avenue
Little Falls, New Jersey 07424
201-256-4965
Fax # 201-256-7383

Fax cover letter

Date: 1/4

Time:

Please deliver the following pages to: DAN . Z.

Company Name: NJDEP

This fax is from: SANJEEV VARGHESE

NOTE: Please find a copy of the Killam Proposal to the city — they submitted this late, hence the delay.

— SANJEEV —

(We are transmitting pages, excluding this cover sheet. If transmission is incomplete, please call our general number for re transmission)

KLL001391

Killam
Associates = Consulting Engineers

27 Bleeker Street
Millburn, NJ 07041-1008
Telephone: 201-379-3400
Fax: 201-376-1072

Nicholas M. DeNichilo, PE
Senior Vice President

January 3, 1996

Mr. Luiggi Campaña
Director, Water and Sewer Utilities
City of Newark
920 Broad Street
Newark, New Jersey 07102

Re: **P94-1002 - City of Newark - Proposal for Professional Engineering Services**
NJPDES General Permit No. NJ0105023 for Combined Sewer Systems

Dear Mr. Campaña:

It was a pleasure to meet with you, Sanjeev Varghese and Paul Butler on December 14, 1995 and discuss the work to be done in satisfying NJDEP's requirements in the permit referenced above. As a result of our discussions, we are submitting this Proposal for Professional Engineering Services in order to assist the City of Newark in preparing the technical materials necessary for submission to the NJDEP by the March 1, 1996 deadline contained in the General Permit.

Understanding the Problem

In 1989 the NJ Legislature enacted the Sewage Infrastructure Improvement Act (SIIA) in response to beach closings caused by debris washed up onto the shoreline. The SIIA in part required that owners of Combined Sewer Overflows (CSO's) provide for the elimination of dry weather overflows and the removal of floatables and solids greater than ½-inch from all discharges. The Act also provided ninety percent planning and design grants to assist municipalities in satisfying the provisions of the law. It is our understanding that the City of Newark already undertook the planning aspects of the SIIA.

In 1994 the USEPA published its final guidelines for implementing its National CSO strategy. The guidelines require each state to develop a unique program for implementing the strategy within its borders. New Jersey, through the Department of Environmental Protection, elected to implement the National CSO strategy through New Jersey Pollutant Discharge Elimination System General Permits for Combined Sewer Systems. The CSO General Permits, in turn, require that each permittee implement nine minimum controls and initiate long term planning for the effective control of CSO's. There are various interim deadlines stipulated in the permit.

It should be noted that one of the nine minimum controls contained in EPA's guidelines is the removal of floatables and solids from all CSO's. The planning for this item has been satisfied under the SIIA grant awarded earlier to the City of Newark.

The first deadline in NJDEP's program for CSO's is March 1, 1996. While the City is ultimately planning to obtain proposals for a comprehensive study of its combined sewer system, the work proposed herein will address the more immediate March 1, 1996 permit deadlines. The work to be performed in the future comprehensive study should provide the City with a good understanding of its combined sewer system. However, due to its anticipated detailed scope which includes integration with the City's GIS system; extensive flow metering; and increased water quality monitoring, it cannot be completed in time for the March 1, 1996 deadlines mandated in the current permit. This proposal which is an interim step to the comprehensive study addresses those items which Newark must complete by March 1, 1996.

Killam Associates is uniquely qualified to undertake the proposed work on such an accelerated schedule since it has conducted several studies in the 1980s for PVSC which included large portions of the City's sewer system. Killam has also performed structural sewer evaluations and has designed rehabilitation projects in connection with the City's multi-phased Brick Sewer Rehabilitation Program. Killam is also an integral member of a project team performing services for PVSC in connection with their CSO permit requirements. PVSC either owns or operates 20 of the 30 total regulators which are also included in the Newark CSO permit. Refer to the attached Plate A which identifies all 30 overflows and indicates the party which operates the regulators. However, since Newark owns the pipe between the regulator and the point of discharge, Newark is also responsible through its permit for all 30 overflows. Since much of the work associated with the overflows is currently being conducted on behalf of PVSC, Newark can use this information in order to comply with a large portion of the permit requirements. Plate A also indicates an area of the City which is not included in the PVSC CSO mapping and land use scope of work (this area is delineated by a green boundary).

In order for the scope of services outlined within this proposal to be completed within the mandated permit deadline, Killam must be authorized to proceed by no later than January 15, 1996.

Scope of Services

The Passaic Valley Sewerage Commissioners (PVSC) is undertaking a comprehensive study to address permit requirements associated with the CSO regulators owned and operated by them. Part of the PVSC's work will satisfy some of Newark's requirements under the CSO General Permit but will not address these requirements for ten City owned or controlled CSO's.

We have also included a listing of the thirty CSO's in Newark and identifies those owned or operated by either the PVSC or Newark. In addition, we have included an overall description of the permit requirements, status of each and references the "Part No" in the permit and the "Deadline" where applicable. This proposal is limited to addressing those items which Newark must complete by March 1, 1996 for the ten purported CSO's owned by Newark and not proposed to be addressed by the PVSC. The task descriptions included in the Scope of Services are described below and correlate to the complete descriptions in Attachment A.

Part No.	Deadline	Requirements and Comments
III.D.1		Interim Solids/Floatables Control Measures
b.	March 1, 1996	1. On or before March 1, 1996 the permittee shall submit a plan for interim solids/floatables removal from each CSO discharge point. This requirement has been satisfied by Newark by the submission to the DEP of the planning study prepared under a SIIA grant. No further work by Killam Associates is included for this item.
III.D.2		Long Term Solids/Floatables Control Measures
b.	March 1, 1996	1. On or before March 1, 1996, the permittee shall submit an approvable Long Term Solids/Floatables Control Measures Plan to the Department. The Plan shall provide for the cap-

ture and removal of solids/floatables which cannot pass through a bar screen of 0.5 inches from all CSO's unless the permittee can demonstrate that an alternative control measure is more appropriate.

As stated in the Interim (as contrasted with the Long Term) control response, this requirement also has been satisfied by Newark by the submission to the DEP of the planning study prepared under a SIIA grant. No further work by Killam Associates is included for this item.

III.E		**Proper Operation and Maintenance**
2.	March 1, 1996	The permittee shall develop, maintain as current, and implement a proper operation and maintenance program.
3.	March 1, 1996	The permittee shall develop O & M Plan and Manuals which shall contain the following elements: 1. Annual Budget Analysis 2. Financial Management System 3. Staffing and Training 4. Emergency Operation Program 5. A System Vulnerability Analysis and Emergency Operations Program 6. Administrative Functions and Operation and Maintenance Manuals The PVSC will prepare an O & M program and manual for the 20 regulators which it owns and operates. Newark, however, must prepare its own O & M program and manual for the 10 CSO's not addressed by the PVSC. Killam Associates will compile this information since Newark already has many components of the O & M program and

manual completed but located in several other documents. The work should be limited to collecting and consolidating these materials into a unified O & M program including the O & M Manual.

III.F. **Maximization of Conveyance of Wastewater to the POTW for Treatment**

3. March 1, 1996 The permittee shall develop a **Facilities Inventory and Assessment Analysis (FIAA)** and incorporate the FIAA into the CSOPPP (Combined Sewer Overflow Pollution Prevention Plan). The FIAA must, at a minimum, contain the following:

a. A sewer service area map delineating existing facilities showing:

I. Delineation of service area for each catchment area of the collection and conveyance system;

ii. Size, type, shapes of all pipes and appurtenances;

iii. Identity and location of each pumping station;

iv. Location, size, type and shape of all interceptor sewers and trunk sewers;

v. Location and identify of each regulator and CSO discharge point;

vi. Show all point source discharges associated with the combined sewer system;

The FIAA is being prepared by the PVSC for most of Newark except for the following areas as shown on the attached map (bounded by green border). Killam will incorporate the PVSC information in the City's FIAA.

Areas tributary to Brown, Lockwood and Blanchard overflows are not CSO areas in all likelihood, but have been included in Newark's CSO permit. Therefore, Killam Associates will prepare the Inventory and Assessment Analysis for all of these areas. Where appropriate, Killam Associates will provide data to assist Newark in demonstrating to the DEP that certain discharges are not CSO's (probable in areas T & U). This task will require field investigation and/or verification of information contained in either Killam or Newark's files.

b. Killam Associates will evaluate existing plans to obtain information upon the City owned and operated flow diversion chambers. Field visits will be conducted on those facilities not included in the present or past PVSC investigations to verify existing plans. Each diversion structure will also be evaluated for the present structural and operating status. All information developed in the field will be included in the FIAA Report.

c. Sketches will be prepared during field investigations to provide details upon CSO regulators and flow diversion chambers owned and operated by the City of Newark. Each sketch will indicate the relative location of the diversion structure as well as, the height of the overflow weir or pipe relative to the invert and rim elevations. Survey work showing the exact location

and elevations of diversion or regulator chambers is not included in this proposal since it is difficult to estimate the number of individual sites until we evaluated any as-built plans available and complete the field work evaluating whether any of the overflows have been abandoned.

V.B. March 1, 1996 **Preparation of the Combined Sewer Overflow Pollution Prevention Plan (CSOPP)**

4.

a. A Monitoring Program Proposal and Work Plan is not included in this proposal.

b. Service Area Drainage and Land Use Report - The Service Area Drainage and Land Use Report is being prepared by the PVSC for most of Newark except for the following areas as shown on the attached map (bounded by green border). Killam will incorporate the PVSC information in the overall Service Area Drainage and Land Use Report.

Areas tributary to Brown, Lockwood and Blanchard overflows are not CSO areas in all likelihood, since overflows have been plugged and abandoned. However, these abandoned overflows require verification. Due to the small size of the questionable drainage areas and the March 1 deadline, Killam will prepare the Service Area and Land Use Report for all of the drainage these basins to supplement the information being compiled by PVSC.

One of the requirements of the Drainage Area and Land Use Report is the development of dry weather flow and average concentration for pollutants. While PVSC will be conducting moni-

toring and sampling of each drainage basin tributary to control facilities owned or operated by PVSC, this information will not be available prior to the March 1, 1996 deadline. Killam will use existing flow information from previous studies (SSES and CSO) to meet the flow requirement, and proposes to take grab samples at each of the City's 30 drainage basins to develop information upon dry weather pollutant loads. This should bring the City into compliance with this requirement.

Cost Proposal

We propose to undertake the work described in this proposal for the lump sum of $102,000.

Our proposal is predicated upon receiving GIS files from the City for the areas to be studied in a timely manner. Our proposal is further based upon the City providing access to the various overflow structures and assisting Killam Associates during the sampling, surveys and inspections of these structures.

While the work proposed by Killam Associates is limited to that described in this proposal, and necessary to satisfy the March 1, 1996 deadline, we wish to call your attention to the two "Annual" requirements described on Page 7 of the attachment. It is our understanding that the first of the annual inspections, certification and reports for the ten CSO's owned or operated by Newark will be due at the DEP by 7/1/96. This date is one year from the date of authorization in Newark's CSO General Permit.

In order for the scope of services outlined within this proposal to be completed within the mandated permit deadline, Killam must be authorized to proceed by no later than January 15, 1996.

Killam

We trust that this proposal is complete and satisfies our agreement reached at our 12/14/95 meeting. If you need additional information, require clarification or wish to meet with us, please do not hesitate to contact us.

Very truly yours,

KILLAM ASSOCIATES

Nicholas M. DeNichilo, P.E.

Joseph G. Stanley, P.E.

NMDN:mfw
cc: S. Varghese
N:\ENG\P94-1002\CAM1222.LET

Attachment A
City of Newark
CSO General Permit Coordination

January 2, 1996

Listing of CSOs Covered in Newark General Permit

CSO No.	Designation	Receiving Water	PVSC Owned or Controlled Regulator	City Owned or Controlled Regulator	Outfall Type
001	Meadowbrook	Second River		Yes	Relief CSO
002	Verona Avenue	Passaic River	Yes		Primary
003	Delavan Avenue	Passaic River	Yes		Primary
004	Herbert Place	Passaic River	Yes		Primary
005	Herbert Place	Passaic River	Yes		Primary
006	Oriental Avenue	Passaic River		Yes	Relief CSO
007	Third Avenue	Passaic River	Yes		Primary
008	Fourth Avenue	Passaic River	Yes		Primary
009	Clay Street	Passaic River	Yes		Primary
010	Clay Street	Passaic River	Yes		Primary
011	Orange Street	Passaic River	Yes		Primary
012	Bridge Street	Passaic River	Yes		Primary
013	Rector Street	Passaic River	Yes		Primary
014	Saybrook Place	Passaic River	Yes		Primary
015	City Dock	Passaic River	Yes		Primary
016	Jackson Street	Passaic River	Yes		Primary
017	Polk Street	Passaic River	Yes		Primary
018	Freeman Street	Passaic River	Yes		Primary
019	Brown Street	Passaic River		Yes	Permitted Storm Outfall
020	Lockwood Street	Passaic River		Yes	Permitted Storm Outfall
021	Blanchard Street	Passaic River		Yes	Permitted Storm Outfall
022	Roanoke Avenue	Passaic River		Yes	Primary
023	Adams Street	Peripheral Ditch		Yes	Primary
024	Wheeler	Peripheral Ditch		Yes	Primary
025	Peddie Street	Peripheral Ditch	Yes		Primary
026	Queen	Peripheral Ditch	Yes		Primary
027	Waverly	Peripheral Ditch	Yes		Primary
028	Haynes Avenue	Peripheral Ditch		Yes	Permitted Storm Outfall
029	Waverly	Peripheral Ditch	Yes		Primary
030	Avenue A	Peripheral Ditch		Yes	Primary

KLL001401

Part No.	Deadline	Requirements and Comments
III.B.2	April 1, 1995	Dry weather overflows are prohibited *Status: Bogart Report recommended following to prevent dry weather overflows:* ▪ *further investigation to determine need to expand capacity of the Dry Weather Flow connection at the regulator for Outfall 024-030 (Wheeler and Avenue A)* ▪ *diversion and reconnection of an internal overflow discharge upstream of the Dry Weather Flow dam in the regulator for Outfall 009-010 (Clay Street)* *Status of these recommendations - Unknown*
III.C	April 1, 1995	All surface water intrusion into the combined sewer collection and conveyance system past the combined sewer overflow control facilities shall be prevented below one foot above the 100 year fluvial flood elevation *Status: Unknown (no recommendations contained in Bogart report)*
III.D.1		Interim Solids/Floatables Control Measures
b.	March 1, 1996	1. On or before March 1, 1996 the permittee shall submit a plan for interim solids/floatables removal from each CSO discharge point. The plan shall include full documentation including: *Status: Newark reportedly made submission to NJDEP for all 30 permitted CSOs (Bogart report with modifications)* a. The methodology used in developing, evaluating, selecting and implementing each particular control method including reasons why some were inappropriate.

Part No.	Deadline	Requirements and Comments
		b. Construction/implementation cost estimates, operation and maintenance costs; and c. An estimate of the anticipated decrease in Solids/Floatables for each control measure
c.	Approval +60 days	2. Within sixty (60) days of permittee's receipt of the Department's written comments on the plan, the permittee shall submit revised plans that include the modifications required by NJDEP. *Status: Open - Awaiting NJDEP comments*
d.	Approval +12 mos.	3a. If it is determined that a Treatment Works Approval is not required: within twelve (12) months of the permittee's receipt of NJDEP's written approval of the permittee's Interim Solids/Floatables Control Measures Plan (PLAN), the permittee shall implement the PLAN. *Status: Open - Awaiting NJDEP comments*
j.	Approval +60 days	3b. If it is determined that a Treatment Works Approval (TWA) is required: *Status: Open - Awaiting NJDEP comments* I. Within sixty (60) days of Department's written conceptual approval, the permittee shall submit an administratively complete Stage II/III TWA application. ii. Within twelve (12) months of the permittee's receipt of the Department's Stage II/III TWA, the permittee shall complete construction and commence operation of the approved Interim Solids/Floatables Control Measures Plan (PLAN).

Part No.	Deadline	Requirements and Comments
III.D.2		**Long Term Solids/Floatables Control Measures** ***Status: Newark reportedly made submission to NJDEP for all 30 permitted CSOs (Bogart report with modifications)***
b.	March 1, 1996	1. On or before March 1, 1996, the permittee shall submit an approvable Long Term Solids/Floatables Control Measures Plan to the Department. The Plan shall provide for the capture and removal of solids/floatables which cannot pass through a bar screen of 0.5 inches from all CSOs unless the permittee can demonstrate that an alternative control measure is more appropriate.
e.ii.	Approval +60 days	2. Within sixty (60) days of the permittee's receipt of the Department's written comments on the plan, the permittee shall submit revised plans that include the modifications required by NJDEP. ***Status: Open - Awaiting NJDEP comments***
e.iii	Approval +12 Mos.	3. Within twelve (12) months of written conceptual approval of the Long Term Plan, the permittee shall submit an administratively complete Stage II/III TWA application. ***Status: Open - Awaiting NJDEP comments***
e.iv	Approval +15 Mos.	4. Within fifteen months of the permittee's receipt of the Department's Stage II/III TWA, the permittee shall complete construction and commence operation of the approved Long Term Solids/Floatables Control Measures Plan. ***Status: Open - Awaiting NJDEP comments***

Part No.	Deadline	Requirements and Comments
III.E		**Proper Operation and Maintenance**
2.	March 1, 1996	The permittee shall develop, maintain as current, and implement a proper operation and maintenance program. *Status: PVSC will be preparing O&M program for the 20 regulators which they own and/or operate and their interceptors.* *Newark is required to prepare an O&M program for all 30 combined sewer overflow discharge points and its combined sewer system.*
3.	March 1, 1996	The permittee shall develop O&M Plan and Manuals which shall contain the following elements: 1. Annual Budget Analysis 2. Financial Management System 3. Staffing and Training 4. Emergency Operation Program 5. A System Vulnerability Analysis and Emergency Operations Program 6. Administrative Functions and Operation and Maintenance Manuals *Status: PVSC will be preparing O&M program for the 20 regulators which they own or operate and their interceptors.* *Newark is required to prepare an O&M program for all 30 overflows and its combined sewer system.*
III.F		**Maximization of Conveyance of Wastewater to the POTW for Treatment**
3.	March 1, 1996	The permittee shall develop a **Facilities Inventory and Assessment Analysis (FIAA)** and incorporate the FIAA into the CSOPPP (Combined Sewer Overflow Pollution Prevention Plan). The FIAA must, at a minimum, contain the following:

No.	Deadline	Requirements and Comments

a. A sewer service area map delineating existing facilities showing:

I. Delineation of service area for each catchment area of the collection and conveyance system;

ii. Size, type, shapes of all pipes and appurtenances;

iii. Identity and location of each pumping station;

iv. Location, size, type and shape of all interceptor sewers and trunk sewers;

v. Location and identity of each regulator and CSO discharge point;

vi. Show all point source discharges associated with the combined sewer system;

vii. Show all point source discharges associated with the combined sewer system;

This information is being prepared for PVSC and will include the entire City with the exception of the industrial area (served by separate storm and sanitary sewers) as noted on the attached map.

b. An inventory and engineering assessment of the operating status and mechanical and structural integrity of the major components of the combined sewer system including the hydraulic performance capability of each component.

This is being done by PVSC for the 20 regulators which are either owned or operated by them. Newark would be required to prepare this assessment for the remaining 10 overflows which are indicated above as being owned and operated by the City.

Part No.	Deadline	Requirements and Comments
IV.		**Monitoring and Reporting Requirements**
A.1	Annually	Annual Inspections must be conducted on all combined sewer overflow control facilities including the following: 1. An engineering assessment of the mechanical and structural integrity and operability of each portion of the combined sewer overflow control facilities. 2. Identification of recommended rehabilitation measures. 3. Evaluation process must be documented including any conclusions and recommendations. *This is being done by PVSC for the 20 regulators which are either owned or operated by them. Newark would be required to prepare this assessment for the remaining 10 overflows which are indicated above as being owned and operated by the City.*
B.1	Annually	Annual Certifications and Reports of Noncompliance *This is being done by PVSC for the 20 regulators which are either owned or operated by them. Newark would be required to prepare this assessment for the control facilities associated with the remaining 10 CSO points which are indicated above as being owned and operated by the City.* 1. An annual certification which certifies that the facility is in compliance, except as noted in (2), with the terms of this permit and the Combined Sewer Overflow Pollution Prevention Plan (CSOPPP) must be submitted to NJDEP. 2. A separate Report of Noncompliance shall also be submitted to NJDEP reporting all instances of noncompliance including: a. Failure to comply with any deadlines;

Part No.	Deadline	Requirements and Comments
		b. Discharge of dry weather overflows; c. Failure to develop and implement proper operation and maintenance programs; d. Failure to develop and/or comply with the a compliance schedule in CSOPPP; e. Failure to perform the annual inspection 3. A separate report on Extended Combined Sewer Overflows must be provided to NJDEP when no precipitation has occurred for at least 24 hours prior to the observation of a discharge event.
V.		**Preparation of the Combined Sewer Overflow Pollution Prevention Plan (CSOPPP)**
A.	March 1, 1996	1. On or before the deadline, the permittee shall establish and implement a CSOPP and shall submit to the Department a properly executed Certification. The CSOPPP shall, at a minimum, contain the following: a. Documentation of the procedures used to develop the Interim Solids/Floatables Control Measures; ***This information is <u>not</u> being performed by or on behalf of PVSC. It is our understanding that the Bogart report and City amendments provide this information for the 30 CSOs listed in the City's General permit.*** b. Documentation of the procedures used to develop the Long Term Solids/Floatables Control Measures: ***This information is <u>not</u> being performed by or on behalf of PVSC. It is our understanding that the Bogart report and City amendments provide this***

Part No.	Deadline	Requirements and Comments

information for the 30 CSOs listed in the City's General permit.

c. Documentation of the evaluation process and the findings of each Annual Inspection (last five years);

This information must be compiled by the City for all 30 CSOs listed in the City's General permit.

d. A record of all incidents of noncompliance and copies of all reports;

This information must be compiled by the City for all 30 CSOs listed in the City's General permit.

e. The Facilities Inventory and Assessment Report;

This information is being prepared for PVSC and will include the entire City with the exception of the industrial area (served by separate storm and sanitary sewers) as noted on the attached map.

f. Copies of all permits associated with the combined sewer system;

This information must be compiled by the City for all 30 CSOs listed in the City's General permit.

g. A copy of completed reports/studies of the Characterization Study;

Refer to Page 10 of this summary for the status of the various aspects of the Overflow Discharge Characterization Study

Part No.	Deadline	Requirements and Comments
		h. Copies of all correspondence between NJDEP and the permittee. ***This information must be compiled by the City for all 30 CSOs listed in the City's General permit.***
		2. The CSOPPP shall be available for review upon request of an authorized representative of the Department and shall be amended as required.
		3. The CSOPPP shall be available to the public for inspection and duplication.
B.		**Preparation and Submission of the Combined Sewer Overflow Discharge Characterization Study**
4a.	March 1, 1996	A Monitoring Program Proposal and Work Plan shall be prepared and submitted to the Department covering all work required under this section including: ***This is being done by PVSC for the 20 regulators which are either owned or operated by them plus the Meadowbrook (001) and Oriental (006) City owned overflows. Newark would be required to prepare this work plan for the remaining 8 overflows which are indicated above as being owned and operated by the City.***
4b.	March 1, 1996	Service Area Drainage and Land Use Report including information on: ***This is being done by PVSC for the 20 regulators which are either owned or operated by them plus the Meadowbrook (001) and Oriental (006) City owned overflows. Newark would be required to prepare this work plan for the remaining 8 overflows which are indicated above as being owned and operated by the City.***

Part No.	Deadline	Requirements and Comments

1. Subcatchment data on area, ground slope, length, width and impervious cover;

2. Major channels/pipes including length, slope, flow direction, and significant non-residential users;

3. Service area map (1:2400) showing land use and service areas by type;

4. Pollutant load factors for each land use pollutant;

5. Service area population data and CSO system component locations and data;

6. Sewer pipe data and capacity of each component including pumping stations and POTW;

7. Dry weather flow and average concentration for each pollutant.

4c. March 1, 1996 **Sewer System Inventory and Assessment Report**

The permittee shall develop and submit narrative and graphical descriptions of the sewer systems which contribute to each CSO point. The report shall include:

1. A comprehensive inventory of all elements including sewer lines, regulators, tide gates, diversion chambers, pumping stations, interceptors, trunk sewers and outfall structures.

This is being done by PVSC for the 20 regulators which are either owned or operated by them. Newark would be required to prepare this assessment for the remaining 10 overflows which are indicated above as being owned and operated by the City.

Part No.	Deadline	Requirements and Comments
		2. The operational status, condition and hydraulic capacity of all facilities ***This is being done by PVSC for the 20 regulators which are either owned or operated by them. Newark would be required to prepare this assessment for the remaining 10 overflows which are indicated above as being owned and operated by the City.*** 3. Plan and profiles of all regulators, tide gates and flow diversion structures ***This is being done by PVSC for the 20 regulators which are either owned or operated by them. In addition, existing information is available for the Adams, Wheeler, and Avenue A facilities. Newark would be required to prepare this assessment for the remaining 7 overflows which are indicated above as being owned and operated by the City.***
4d.	Approval of Work Plan + 12 Mos.	**Rainfall Monitoring Study** which shall include: ***This information is being prepared by PVSC and should cover the entire City area.*** 1. A historic precipitation analysis 2. The establishment of a rain gauge network appropriate for the size of study area. 3. Continuous measurements and records of rainfall throughout the monitoring period
4e.	Approval of Work Plan + 12 Mos.	**Combined Sewer Overflow Monitoring Study** which shall include: ***This is being done by PVSC for the 20 regulators which are either owned or operated by them plus***

Part No.	Deadline	Requirements and Comments
		the Meadowbrook (001) and Oriental (006) City owned overflows. Newark would be required to prepare this work plan for the remaining 8 overflows which are indicated above as being owned and operated by the City. Collection and analysis of representative samples of the actual CSOs during wet weather events. The permittee shall monitor a sufficient number of significant storm events to adequately calibrate and verify the model. The frequency of sampling shall not exceed one sample every fifteen minutes unless otherwise approved by the Department.
4f.	Approval of Work Plan + 12 Mos.	**Combined Sewer System Modeling Study** which shall include: The development of a SWMM model of the permittee's combined sewer system, and CSO points in conformance with the approved Work Plan. *This is being done by PVSC for the 20 regulators which are either owned or operated by them. Newark would be required to prepare this assessment for the remaining 10 overflows which are indicated above as being owned and operated by the City.*

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Meeting with NE State NJDEP
held on 8/23/95, 10:00 AM
at Central Ave, Newark.

1.	SANJEEV VARGHESE	Newark	201-256-4965
2.	Andrea Hall	Newark	201-733-5972
3.	Dan Zeppenfeld	NJDEP	609-633-7020
4.	Charles Jenkins	NJDEP	609-292-5563

Received RFP

8/25/95

called Sanjeev suggested RFP state criteria by which consultants will be ranked.

8/23/95

Advised Sanjeev that submissions like S/F Control Plan should be directed to NJDEP by the City of Newark with a letter of transmittal. Interim & long-term S/F Control Plan should be accompanied by ATT D Certification signed by Secretary

DRAFT

Request for Proposal

Combined Sewer Overflow Discharge Characterization Study

General

The City of Newark is requesting proposals for conducting a study to characterize the City's combined sewer system and its discharges through a monitoring and modeling program. The work shall not include in-stream monitoring or modeling.

The City is permitted to operate its combined sewer system for the collection and conveyance of wastewater and to discharge its CSOs to the Passaic River and the Newark Bay under an individual NJPDES/DSW General Permit Authorization under the General Permit for Combined Sewer Systems, NJPDES Permit No. NJ0105023, issued by the New Jersey Department of Environmental Protection (NJDEP). This permit, which complies with the National CSO Policy, requires the City to perform a system characterization study and submit a report to the NJDEP

A pre-proposal conference will be held on September 20, 1995, at 10:00 A.M. at the following address. All respondents are encouraged to attend.

All responses to this request for proposal should be sent to :

Complete responses including a separate sealed cost proposal, must be received at the above address by October 18. 1995 at 4:00 P.M. local time. There will be no exceptions to this deadline. Submittals should include five (5) copies of the response to the RFP.

The City reserves the right to reject any proposal for what it considers to be in its best interest Further, the RFP does not commit the City to pay costs incurred in the submittal of Proposals and does not commit the City to procure or contract services.

DRAFT

KLL001415

Study Objectives

The purpose of the system characterization, monitoring and modeling program is to develop a system model with respect to both quantity and quality, which represents the City's existing combined sewer, interceptor and overflow systems. The model shall be calibrated and verified with field data The model will be used to assist the NJPDES permittee in defining discharge characteristics for input to an upcoming Newark Bay, Passaic River Watershed study. The system model will represent the combined sewer system response to historical precipitation events.

Background

The City of Newark, the Essex County Seat, is New Jersey's most populous city with 275,000 residents. It includes about 24 square miles, of which about 10.4 square miles are served by combined sewers. Three hundred miles of collection sewers, many 100 years old, discharge to interceptors for conveyance to the PVSC treatment plant. The 340 mgd rated capacity plant is located in the southeastern corner of the City, and Newark flow accounts for about 30 percent of the average PVSC plant flow. Sewage is delivered to the PVSC plant by the PVSC Main Interceptor, Newark's Southside Interceptor and the Cross Bay Force Main serving Hudson County Twenty-four CSOs discharge untreated combined sewage in excess of interceptor capacities to the tidal Passaic River and via the Peripheral Ditch to the Newark Bay. The tributary areas of these CSOs range from 3 to 1770 acres. An experimental program is in progress at two of the combined sewer outfalls using netting to trap floatables in the discharges

The City owns the regulators but these regulators are operated and maintained by the PVSC. Most of the float operated gates that were once used to regulate flows that enter the PVSC interceptor, have been abandoned or removed, and replaced with fixed orifices and knife gates Knife gates are remotely operated with signals transmitted by telemetry. When the Plant flow approaches 480 mgd, the PVSC operator closes the gates at one or more of the points of interception until plant flow stabilizes at a peak of 480 mgd. The gates are reopened when their closure is no longer needed to restrict plant flows to 480 mgd or less. There are provisions for manual operation of the gates if the telemetry fails.

KLLC01416

Scope of Services

The services to be provided shall conform to the work components specified in the NJPDES General Permit issued January 27. 1995 and include:

1. Monitoring Program Proposal and Work Plan

   The Monitoring Program and Work Plan for conducting the system characterization study shall conform with the requirements specified in the USEPA report "Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring" dated May. 1984. At a minimum, the Report shall address all the work components "a" through "f" in this study. The Plan shall be submitted to NJDEP for approval

2. Service Area Drainage and Land Use Report

   The report shall include the information used to construct the system model and shall contain, as a minimum. the information set forth in General Permit No. NJ0105023. All methods of estimation used to produce the data shall be presented in graphical, tabularized. and narrative formats as appropriate.

3. Sewer System Inventory and Assessment Report

   The contractor shall develop and submit a report that provides both narrative and graphical descriptions of the city's sewer systems which contribute flow to CSO points The report shall provide a comprehensive inventory of all elements of the combined sewer system including. but not limited to, all sewer lines, regulators, tide gates, diversion chambers pumping stations, interceptors, trunk sewers, and outfall structures. The report shall include operational status, conditions, and hydraulic capacity of all facilities Detailed drawings of all regulators, tides gates, and flow diversion structures in both plan and profile view are also to be included. Field verification of all information will be required. The sewer system shall be computerized in a GIS system compatible to that the City is currently using. The GIS system shall be turned over to the City to facilitate future system planning.

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4. Rainfall Monitoring Study

The study shall include a historic precipitation analysis which, at a minimum, includes the evaluation of climatological records, and the determination of historic and measured rainfall event statistics A rain gage network appropriate for the size of the study area and the model selected for the study shall be developed. Rainfall monitoring shall continue throughout the flow monitoring period and shall correlate with other monitoring data in real time

5. Combined Sewer Overflow Monitoring Study

The monitoring study shall consist of a continuous flow metering at a majority of CSOs, and collecting and analyzing representative samples of the actual CSOs for the parameters required in the Permit. A sufficient number of significant storm events, at least two, shall be monitored to adequately calibrate and verify the model. The sampling program shall be appropriate for the sophistication of the model selected for the study The sampling intervals shall be small to adequately reflect the "first flush" phenomenon of a combined sewer system caused by resuspension of sewer sediments which are deposited in flat sewers during dry days. As a minimum, the interval of wet weather sampling during the first hour shall not exceed fifteen (15) minutes Thereafter the frequency shall not exceed one sample every fifteen (15) minutes

6. Combined Sewer System Modeling Study

The contractor shall use EPA SWMM or an equivalent model approved by NJDEP to model the City's combined sewer and overflow systems. It will be the responsibility of the contractor to obtain NJDEP approval if other than SWMM is proposed.

The selected model shall have real time control capability of operating the City's gated regulator structures These gates shall be operated to minimize the CSO discharge while maximizing in-line storage and treatment of pollutants without offsetting the PVSC treatment efficiency The model shall be properly calibrated and

KLL001418

verified with field data collected in (5).

This work is to be financed in part under the Federal Water Pollution Control Act (P.L. 103-327) which includes a grant to the City for $44,300,000 for combined sewer overflow construction and sewer segment repair. Accordingly, the pertinent requirements of the EPA Uniform Administrative Requirements for Grants (40 CFR 31; 53 FR 8074 March 11, 1988, Revised through July 1, 1991) shall apply. The following specific Federal laws and Authorities also apply to this work: PL 93-291; 42 U.S.C. 7506(c); 16 U.S.C. 3501 et seq.; PL 92-583 as amended; 16 U.S.C. 1531, et seq.; Executive Orders 11938 and 11990; 7 U.S.C. 4201 et seq.; PL 85-624 as amended; PL 89-665 as amended; Section 1424(e) of PL 92-523 as amended; PL 90-542 as amended; PL 89-754 as amended; Section 306 of the Clean Air Act and Section 508 of the Clean Water Act and Executive Order 11738; PL 94-135, PL88-352, Section 13 of PL 92-500; Executive Orders 11246, 11625 and 12123; PL 93-112, including Executive Orders 11914 and 11250; PL 91-646; and Executive Order 12549.

Firms seeking the award must define the qualifications of the firm, or, if a joint venture, the joint venture firms to perform the work, as well as those of each subconsultant. The services to be provided by each firm and each sub-consultant should be defined. Proposed key personnel, their level of commitment, and their qualifications and experience shall be described. The methodology proposed to be used, and a progress schedule to indicate the City will be able to comply with the deadlines stipulated in the Permit, must be included.

Any resulting agreement will have as a goal the performance of _____ percent of the agreement work (based on dollar value) through the use of _____ percent of disadvantaged business enterprises (DBE) and _____ percent of women owned business enterprises (WBE) holding current valid certificates of registration under any State MBE/DBE or WBE program. A copy of such certification shall be included in the qualifications packet.

The City will evaluate the qualifications of all firms responding to this request for proposals and shall prepare a short list of firms it deems most qualified based on their qualifications. Interviews will be held with the shortlisted firms, ranking them in order of the best interests of the City.

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The cost proposal of the first ranked firm will be opened and negotiations to determine the costs and scope to be included within the contract entered into. If agreement cannot be reached with the first ranked firm, the negotiations will be terminated and negotiations entered into with the second ranked firm. This process will be repeated until an agreement on scope of contract and cost is reached.

All past reports and other information relative to past work performed for the City which is pertinent to the sewer system is available by appointment at the following address.

KLL001420

Newark

Sharpe James
Mayor

Department of Water and Sewer Utilities

Luiggi Campana
Director

Division of Sewers and Water Supply

Daniel Berardinelli, P.E.
Manager

1294 McBride Avenue
Little Falls, New Jersey 07424
201-256-4965

SEP 1995

August 28, 1995

Mr. Werner Speer
Passaic Valley Sewerage Commissioners
600 Wilson Avenue
Newark, N.J. 07105

RE: CITY OF NEWARK - COMPLYING WITH CSO GENERAL PERMIT

Dear Mr. Speer:

As you are aware, the City of Newark is currently subject to General Permit No. 0105023 in the operation of its combined sewer system. This permit requires, among other actions, the following:

1. Submitting an interim solids/floatables control plan.
2. Implementing the interim plan.
3. Submitting a long term solids/floatables control plan.
4. Implementing the long term plan.
5. Execute a continuous rainfall and combined sewer overflow monitoring study.
6. Perform a combined sewer system modeling study.

The USEPA has also promulgated a final combined sewer overflow policy which requires a number of actions to limit CSO pollution, among which are:

A. Maximizing flow to the treatment plant, and
B. Controlling solids and floatable materials in CSO's.

The USEPA has consistently reiterated that the long term plan "should be designed to allow cost effective expansion or cost effective retrofitting, if additional controls are subsequently determined to be necessary to meet water quality standards(WQS, including existing and designated uses." There are conditions under which WQS in wet weather can be relaxed provided dry weather WQS are maintained.

The NJDEP "Response to Comment Document" referring to General, Permit No. NJ 0105023 for Combined Sewer System states on Page 8

"The general permit is only part of a comprehensive effort required to bring waters of the State into compliance with the State WQS."

To meet the requirements stated above, the City has accomplished the following:

1. Prepared a report entitled "Combined Sewer Overflow Abatement Strategy" dated August 1993 and submitted to NJDEP.
2. Responded to comments by the NJDEP to this report on March 28, 1994;
3. Responded to comments on this report to the PVSC on April 1, 1994; and
4. Prepared an addendum to the August 1993 report dated December 13, 1994 in anticipation of the issuance of General Permit No. N.J. 0105023. This addendum evaluated the proven SOS screen as the initial phase of a long term CSO pollution abatement program.

The report addendum was forwarded to your office some time ago. The NJDEP is awaiting your comments and/or concurrence with the use of SOS or similar screens described in the addendum. The SOS or similar screens would have less than one-half inch spacing between bars. The design of the screen structures provides a trap to prevent large heavy materials from reaching or passing through the screen.

Based on the 1994 testing of Trshtrap netting systems at the Peddie and Saybrook Outfalls, the floatables rate of capture at Saybrook varied between a peak of 2.55 and a minimum of 0.21 pounds per acre per inch of rainfall. The average rate was 1.36 pounds. At Peddie, the respective rates were a peak of 2.25 and a minimum of 0.43 pounds, with an average of 1.31 pounds. As shown on the attached graph which plots all complete data presented in the revised interim report entitled CSO Floatable Control dated February 1994, a peak loading rate of 2.6 pounds per inch per acre and a one-inch total rainfall would present a conservative design basis. The loading rates were very low for rainfalls with higher rainfall amount, as should be expected. At a plant flow of 480 mgd, the increase in suspended solids

concentration due to the proposed screens would be very minimal. The relatively short period of operation of the screens (rainfall duration generally between 2 to 5 hours with one of 9 hours and one of 13 hours during the test) should not adversely affect either plant or interceptor operation because of the nature of the materials captured by the screen and diverted to treatment.

We would appreciate your concurrence with the use of these screens. We would be glad to meet with you so that the matter, and any concerns you may have, can be resolved.
Mr. Dan Zeppenfield from NJDEP, Division of Water Quality and Permitting, also expressed his willingness to be present at this proposed meeting, if required. An early response from you would be greatly appreciated.

Very truly yours,

Daniel Berardinelli

Daniel Berardinelli, P.E., Manager
Division of Sewers & Water Supply

cc: Luiggi C. Campana, Director,
Department of Water & Sewer Utilities.
Alvin Zach, Department of Engineering.
Andrew Pappachen, Supervising Engineer.
Sanjeev Varghese, Principal Engineer Hydraulics.
Dan Zeppenfield, NJDEP.
Robert Davenport, PVSC.
Sheldon Lipky, PVSC.

CSOPVSC.WPD

COMBINED SEWAGE FLOATABLE WASHOUT RATE

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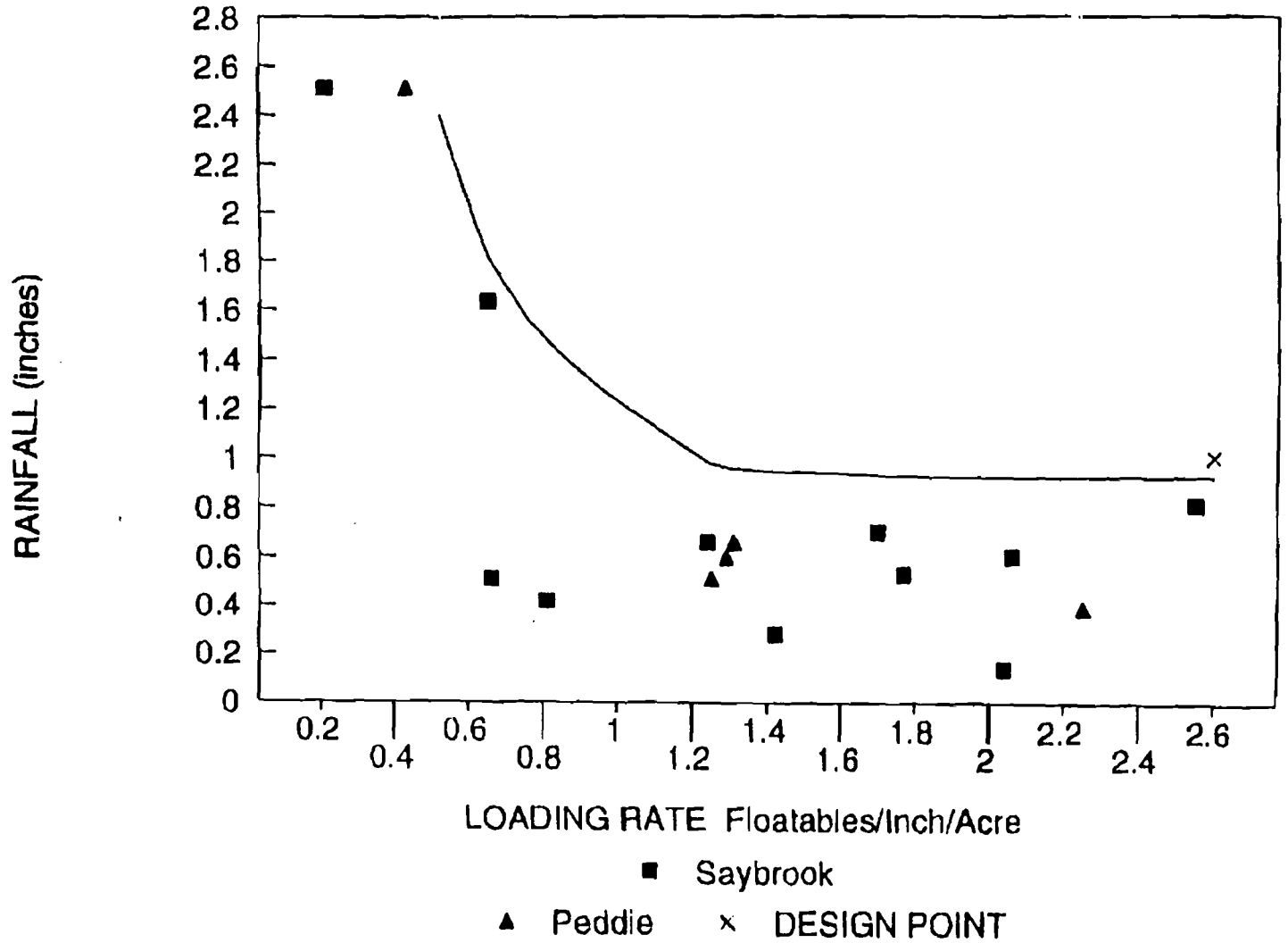

POLLUTION ABATEMENT PLAN

NEWARK

CITY OF NEWARK, NEW JERSEY

KLL010515

POLLUTION ABATEMENT PLAN

NEWARK, NEW JERSEY

1975

Prepared for

CITY OF NEWARK
DEPARTMENT OF PUBLIC WORKS

Prepared by

PURCELL ASSOCIATES
ENGINEERS • ARCHITECTS • PLANNERS

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INTRODUCTION

The City of Newark is located on the Passaic River at the river's confluence with Newark Bay. These waters that form 50 percent of Newark's boundaries were instrumental in the City's foundation and have been a prime factor in much of the City's growth. In the early years of our nation all heavy transportation was done on the water. The fact that water transport is still highly significant is demonstrated by the extremely rapid growth of Port Newark in the last ten years.

Much of the tidal lands along the river and bay have been filled and developed for industry, commerce and transportation. The once green hills above the meadows have been covered with some of the most dense residential and commercial development in the Country resulting in a present population of about 390,000. Commercial and industrial growth continues in the low land areas even today as man has discovered a variety of ways to build upon what previously could be called marginal land.

Early in the development of Newark the flow in both the Passaic River and the smaller streams was sufficient to assimilate the domestic and industrial wastes which were discharged into them. In the mid-1800's as the intensity of development increased, it became necessary to enclose the streams in conduits to provide adequate roadways and to protect private property from flooding. The sanitary wastes which had been discharged into the streams were also diverted into these same conduits. During dry weather these conduits carried primarily sanitary waste and discharged it into the river and meadows. During wet weather the conduits carried both storm runoff and the sanitary discharges.

The dry weather flow, consisting primarily of sanitary sewage, eventually caused pollution problems in the river and bay. This led to the construction of interceptor sewers and a treatment plant by the Passaic Valley Sewer Authority to control the pollution of Newark Bay during dry weather periods.

In Newark the existing combined sewers were connected to the Passaic Valley Interceptor by regulating chambers. The dry weather flow was carried into the Interceptor and the storm flow was diverted into the river and tidal marshes. Storm flow diversion was necessary because runoff greatly exceeded the capacities of the Interceptor Sewer and Treatment Plant.

The Passaic Valley Interceptor Sewer parallels the Passaic River from Paterson to Newark and collects dry weather sanitary flow for this 25 mile reach of the River. In spite of this, the Passaic River has been labeled one of the ten dirtiest rivers in the country. Industrial discharge, inadequately treated municipal sewage, litter, and combined sewer overflows are severe enough to merit national attention.

The City of Newark is drained principally by the combined sewers constructed between 1830 and 1930. When it rains, tremendous volumes of combined sewage are discharged into the Passaic River and the tidal marshes. These combined sewer overflows are presently the prime pollution source from the City of Newark. The intensity of development has tremendously increased the quantity of both the storm runoff and the pollutants which it carries through the combined sewers into the receiving waters. The increased storm flows have caused severe flooding problems particularly in the low areas. For example, the Frelinghuysen Avenue area is one of the most frequently flooded areas in the City. As little as one half inch of rainfall, which occurs several times a year, causes several feet of flooding along this heavily traveled principal roadway and adjacent property. The development of the upstream watershed, however, is not solely responsible for this condition; aborted channels, downstream development and continually poor maintenance of channels and appurtenant structures are other causes.

Port Newark and the Newark Airport have been reclaimed from a large tidal marsh previously called Newark Meadows. Significant areas along the lower Passaic River have also been reclaimed for industrial use. The ground elevations of these marshes prior to reclamation ranged from +5 to -5 feet, mean sea level, for a distance of up to 3 miles from open water. Prior to development when high tides and heavy rains occurred, the entire marsh land would become submerged. With the filling of the marshes for industrial development and transportation facilities, the drainage has been confined to channels. Frelinghuysen Avenue is located three miles west of the bay and its elevation ranges from 5.5 to 12 feet above mean sea level. Tide levels have been recorded as high as 7.9 feet in Newark Bay. Thus, it is apparent that storm water cannot flow by gravity into the bay against a high tide. To provide adequate drainage for Frelinghuysen Avenue and other low areas around the Newark Meadows, a storm water pump station has been pro-

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posed.[13] This pump station and associated drainage work will greatly reduce the frequency of flooding in these low areas.

In the past decade it has been determined that the pollutional effect of combined sewer wet weather overflows is substantial, and both the New Jersey State Department of Environmental Protection, and the Federal Environmental Protection Agency are opposed to the discharge of combined wastes into receiving waters. Until recently the solution has been to construct sewer systems such that all sanitary flows are conveyed to a treatment plant at all times and storm runoff is discharged directly into the receiving waters. Recently, it has been found that storm runoff from urban areas also has a high pollution load. Because of this, treatment of storm water runoff from urban areas is being investigated by the Federal Government. It is possible that in the not too distant future Federal laws could be passed establishing quality criteria for storm runoff which could, in turn, require storm water treatment.

There are two possible ways to meet the present requirements of the State and Federal Governments for the elimination of the existing combined sewer overflows. Existing State and Federal regulations could be met by installing a separate sanitary sewer system which would be connected directly to the Passaic Valley Interceptor Sewers and Treatment Plant. If this alternative is followed, it is still possible that a storm water treatment facility could be required in the future.

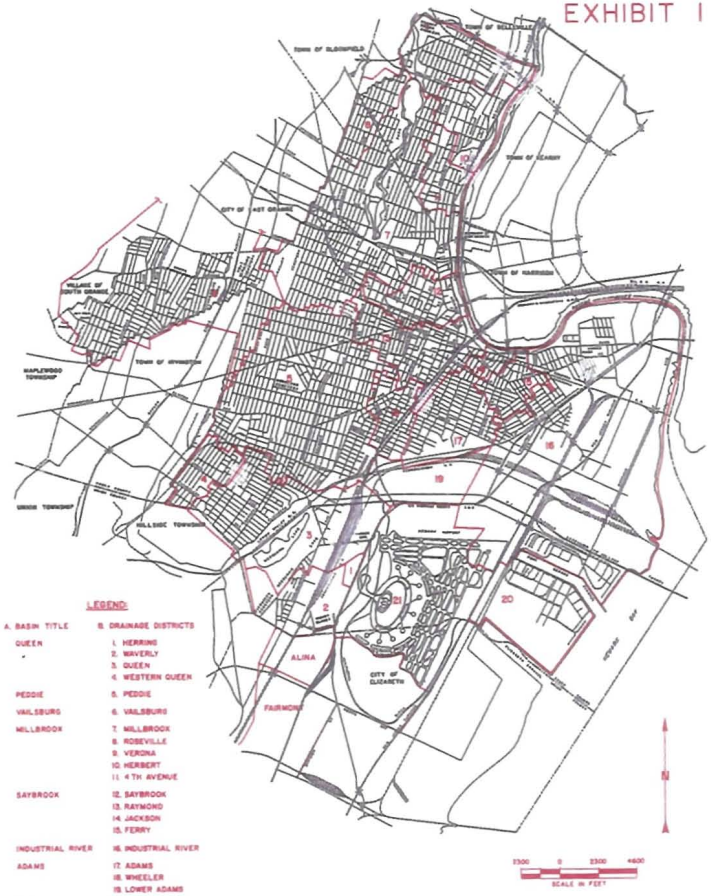
The second alternative that will meet the existing State and Federal regulations is the construction of a combined sewer overflow treatment facility. During storm runoff periods the treatment facility would remove the majority of the pollutants from the combined flow prior to its discharge into the receiving water. The construction of a combined sewer treatment facility would also meet the probable criteria that might be established for storm runoff thereby eliminating a double expenditure. A complete analysis of both schemes will be presented in this report.

The severe flooding along Frelinghuysen Avenue makes it essential that drainage improvements, including the storm water pump station, be constructed at the earliest possible date. To expedite that vital project, an Interim Report was released in April, 1972. That report, the contents of which are herein included, presented a Basin Master Plan for the area tributary to the Newark Meadows. That plan has been approved by the Newark City Council, the Federal Environmental Protection Agency and the State of New Jersey, Department of Environmental Protection, and the initial projects have been constructed. The drainage basins which were included in the Interim Report were the Peddie, Queen, Waverly, Wheeler, Adams and Airport.

In summary, there is a two-fold problem for which this Study and Analysis will present a solution: (1) the extensive and frequent flooding must be controlled, and (2) the pollution caused by the wet weather overflows of the combined sewers must be abated.

KLL010522

EXHIBIT 1



LEGEND:

A. BASIN TITLE	B. DRAINAGE DISTRICTS
QUEEN	1. HERRING
	2. WAVERLY
	3. QUEEN
	4. WESTERN QUEEN
PEDDIE	5. PEDDIE
VAILSBURG	6. VAILSBURG
MILLBROOK	7. MILLBROOK
	8. ROSEVILLE
	9. VERONA
	10. HERBERT
	11. 4TH AVENUE
SAYBROOK	12. SAYBROOK
	13. RAYMOND
	14. JACKSON
	15. FERRY
INDUSTRIAL RIVER	16. INDUSTRIAL RIVER
ADAMS	17. ADAMS
	18. WHEELER
	19. LOWER ADAMS
BAY	20. BAY
AIRPORT	21. AIRPORT

DRAINAGE LIMITS

EXHIBIT 2

MAJOR FACILITIES

KLL010523

INDUSTRIAL RIVER DISTRICT

Introduction

The Industrial River District is located in the eastern portion of the city. As shown on Exhibit 61, it is bounded on the north and east by the Passaic River, on the south by the City Channel at Port Newark, and on the west by Ferry Street and Pulaski Street.

The Industrial River Drainage Basin contains approximately 3650 acres, of which 94 per cent is industrial and commercial and the remaining 6 percent residential. A substantial portion of this Basin is covered by major transportation routes such as the New Jersey Turnpike, U.S. Routes 1-9, the Newark & New York Branch of the Central Railroad of New Jersey, and the Penn Central Railroad. The 1100 acres west of Route 1-9 is almost entirely developed, while the area east of Route 1-9 is about 60 per cent developed. The land is extremely flat, varying in elevation from only about 10 feet above mean sea level in the western portion of the Basin to sea level in the eastern portion of the basin at the Pasaaic River, to which it drains.

Many large industrial facilities are located within the Basin, and many more are proposed, mostly in the less densely developed section east of Route 1-9. Major industries such as Celanese Corporation of America, Federal Pacific Electric, Highlander Sportswear, Peoples Express, DeVoe Reynolds, and others own land in this section which they plan to develop in the future. Ideal Toy Company has just completed the construction of a major manufacturing facility along Wilson Avenue between Avenue "P" and Doremus Avenue. This industrial project alone covers about 76 acres.

Major oil companies such as Hess, Sunoco, Texaco, and others operate oil storage and handling facilities along the Passaic River in the eastern portion of the District. Until 1972, P. Ballantine & Sons, Inc. operated a major brewery on Ferry Street, west of Route 1-9.

A major automobile unloading and storage faiclity, covering about 50 acres, is located in the southern portion of the District, along the east side of Doremus Avenue between the New Jersey Turnpike and the Penn Central Railroad. To the west of this facility is a 100 acre tract of undeveloped land bounded by Doremus Avenue, the New Jersey Turnpike, the Newark & Elizabethport Railroad, and the Penn Central Railroad. This tract is presently owned by the Railroad, which has recently leased it to the Port of New York Authority.

The Passaic Valley Sewerage Commissioners sewage treatment plant is located in the east-central portion of the District, within the block formed by Delancy Street, Doremus Avenue, Wilson Avenue, and Avenue "P". Construction of additional primary treatment facilities is now underway.

Other notable features of this District are a drive-in movie theater on Routes 1-9 near Interchange 15 of the New Jersey Turnpike and two government housing projects on Chapel Street and Hawkins Street.

Exhibits 62 and 63 present the location of the major water, gas, electric and telephone utilities throughout this district.

Sewer Separation Plan

The Industrial River District is almost completely separated. One small area in the northeast section of the district is served by combined sewers and three other areas are served by undersized sanitary sewers. As shown on Exhibit 64, new sanitary sewers have been proposed for these four areas. The estimated construction cost of these new sanitary sewers is presented in Table VII-13.

TABLE VII-13

INDUSTRIAL RIVER DISTRICT
COST ESTIMATE - SEWER SEPARATION

Location	Pipe Size in Inches	Estimated Cost
Delancy St.	27	$ 196,000
Doremus Ave.	18,30	394,000
Avenue P	15,21	208,000
Wilson Ave.	15,24,36	588,000
Ball St.	12	79,000
Avenue K	21	127,000
Foundry St.	21	116,000
Newark Port (Doremus Ave. - Port St.-RR Easement-R.O.W.)	30,36,42	952,000
Subtotal		2,660,000
Lateral Sewer Cost 50 acres x $12,000		600,000
Total		$3,260,000

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EXHIBIT 61

EXISTING SEWERS
INDUSTRIAL DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010613

EXHIBIT 62

EXISTING UTILITIES
INDUSTRIAL DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

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EXHIBIT 63

EXISTING UTILITIES
INDUSTRIAL DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLLC10615

EXHIBIT 64

SEPARATION PLAN
INDUSTRIAL DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

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STORM DRAINAGE

Southern Portion of Industrial River District

The Southern portion of the Industrial River District, bounded on the north by the Central Railroad of New Jersey, is presently drained by several drainage ditches including Pierson's Creek. As shown on Exhibit 61, the storm sewer system for the residential area to the northwest drains to a 3.5' x 9.0' box culvert on Avenue "L" which discharges into Pierson's Creek at Wilson Avenue. Chronic flooding conditions in the area have proven the existing drainage system to be inadequate, and relief sewers will be required to supplement the existing facilities. Cost estimate for these facilities, as shown on Exhibit 65, is presented in Table VII-14.

TABLE VII-14

SOUTHERN PORTION OF INDUSTRIAL RIVER DISTRICT
STORM SEWER COST ESTIMATE*

Location	Pipe Sizes In Inches	Estimated Cost
Delancy Street	68 x 106, 58 x 91	$ 678,000
Avenue I	54	55,000
Backus Street	54	86,000
Gotthart Street	54	164,000
Wilson Avenue	54, 72	258,000
Avenue L	72	360,000
St. Charles Street	60	95,000
Margaretta Street	36	52,000
Niagara Street	36	140,000
Magazine Street	36, 48	94,000
TOTAL		$1,982,000

*Northwestern section only.

72" diameter sewers will be required along both Wilson Avenue and Avenue "L". An open channel is proposed downstream of the Avenue "L"-Wilson Avenue intersection since the area is largely open and undeveloped.

The total area tributary to this channel is 286 acres, and the computed design flow is 600 CFS.

Several alternative channel alignments were investigated. The first alignment was along existing Pierson's Creek, but this alternative was abandoned because it would involve many costly and difficult culvert crossings and does not drain the area east of the Central Railroad of New Jersey. It was then decided to align the channel in a southerly direction from Wilson Avenue to the intersection of the Lehigh Valley Railroad, the New Jersey Turnpike and the Central Railroad of New Jersey, and then easterly to Newark Bay. Pierson's Creek will remain to drain the area west of the Central Railroad not served by the proposed channel.

For design, the downstream controlling water level in Newark Bay was assumed to be 3.0' above mean sea level, which is approximately mean high water. In the Wilson Avenue area, existing elevations in developed areas are as low as 4.0' above mean sea level. Thus, the maximum allowable surface elevation at the upstream end of the channel was determined to be 3.0' above mean sea level. Since there is no hydraulic gradient available to drain the area by gravity flow, pumping is required.

It was decided to locate the pump station just west of the intersection of the Central Railroad and the N.J. Turnpike, approximately 400' south of Delancy Street. This location was selected for 2 reasons: (1) The required rail crossings can be made by force main, which can be jacked under the existing rails without interrupting service and at a substantially reduced cost; and (2) existing elevations in the developed areas east of the Central Railroad permit a design water elevation of 6.0' above mean sea level, which means this area can be drained by open channel gravity flow.

The peak flowrate tributary to the pump station was computed to be 1200 CFS, which would require a large and costly facility. Therefore, the area between Wilson Avenue and the pump station was investigated to determine the feasibility of constructing a detention basin to reduce the peak flow. A hydrograph analysis of the district revealed that the peak flow could be cut to approximately 600 CFS by constructing a 762,000 cubic foot detention basin upstream of the pump station. An open, undeveloped area sufficiently

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large for this size basin exists between Pierson's Creek, Delancy Street, and the Central Railroad. Therefore, construction of the detention basin at this location is recommended, since the cost saving from the smaller pump station in half is far greater than the cost of the detention basin. In fact, in view of the relatively small cost of the detention basin relative to the cost of the other improvements, it is recommended that consideration be given to a more detailed study of the feasibility of constructing a larger detention basin to further reduce the required size of the pump station.

With the detention as part of the recommended plan, a flowrate of 600 CFS was used for design of the pump station. Based on a water level of +3 at the low point of Wilson Avenue, it was found that a trapezoidal channel section with 2:1 side slopes, 20 foot bottom width, and an invert slope of 0.10% would be sufficient to carry the design flow of 600 CFS. Assuming normal flow conditions, the depth in this channel at the design flow rate of 600 CFS would be 5.5'. The invert at the upstream end of the channel would be (-)2.5 and at the pump station would be (-)5.1. The water level at the pump station would be +0.40.

To conserve headroom and facilitate jacking for the rail crossings, it was decided to use twin pipes for the force main, rather than a single large one. This would also allow the use of only one of the pipes during conditions below peak flow. It was found that twin 72" sewers would be required. The velocity in these pipes will be approximately 11 FPS at a flowrate of 300 CFS each.

From the pump station to Newark Bay, two alternate channel alignments were investigated. The first, hereafter known as the Lehigh Valley Railroad Alignment, involves a main channel along the north side of the Lehigh Valley Railroad from the force main terminus to Newark Bay, with a secondary channel along the north side of the New Jersey Turnpike Extension to drain the areas south of the Lehigh Valley Railroad and east of the Central Railroad. The alternate route, hereafter known as the New Jersey Turnpike Extension Alignment, would have the main channel extend southerly from the force main terminus to the N.J. Turnpike Extension, then along the north side of the Turnpike Extension to Newark Bay. Under this alignment, a secondary channel would be required along the north side of the Lehigh Valley Railroad to drain the area north of the Lehigh Valley Railroad and east of the Central Railroad. The two alignments are shown on Exhibit 65 and are discussed in detail below.

Lehigh Valley Railroad Alignment

Under this alignment, the terminus of the force main would be approximately 500 feet east of the Central Railroad, and the main channel would extend along the north side of the Lehigh Valley Railroad to its discharge at Newark Bay.

The low lying areas along the Lehigh Valley Railroad are undeveloped, and it is assumed that they can be filled. However, existing elevations in some of the developed areas limit the design water level at the force main terminus to 6 feet above mean sea level. A design water level of +3 in Newark Bay and +6 at the force main terminus approximately 7300 feet upstream yields a design slope or 0.04% for the main channel. Based on this slope, a trapezoidal channel with 20 foot bottom width, 2:1 side slopes and depths of 9 feet at Newark Bay and 7 feet at the terminus of the force main proved to be the most satisfactory section. It was also found that the following culverts would be required:

1. A twin 6' x 16' reinforced concrete box culvert under the Lehigh Valley Railroad spur

2. An 8' x 20' reinforced concrete box culvert under Doremus Avenue.

The remaining area south of the Lehigh Valley Railroad and east of the Central Railroad will be drained by a secondary channel, which will run along the north side of the New Jersey Turnpike Extension to Newark Bay. Higher existing elevations in this section allow the use of a design water surface of 9 feet above mean sea level at the upstream end of this channel. Based on a water level in Newark Bay of +3 feet and a water level in the channel of +9 feet at the upstream end approximately 7900' away, the available design slope is 0.08%. This channel would have a Central Railroad and, based on the design slope of 0.08%, would be trapezoidal section with 2:1 side slopes and a bottom width of 6 feet at the upper end, widening to a bottom width of 12 feet approximately 700 feet west of Doremus Avenue. The bottom width for the remainder of the channel to Newark Bay is 12 feet. A 7' x 16' reinforced concrete box culvert will be required to cross Doremus Avenue.

New Jersey Turnpike Extension Alignment

Under this alignment, the force main terminus would be approximately 600 feet east of the Central Railroad and 1000 feet south of the Lehigh Valley

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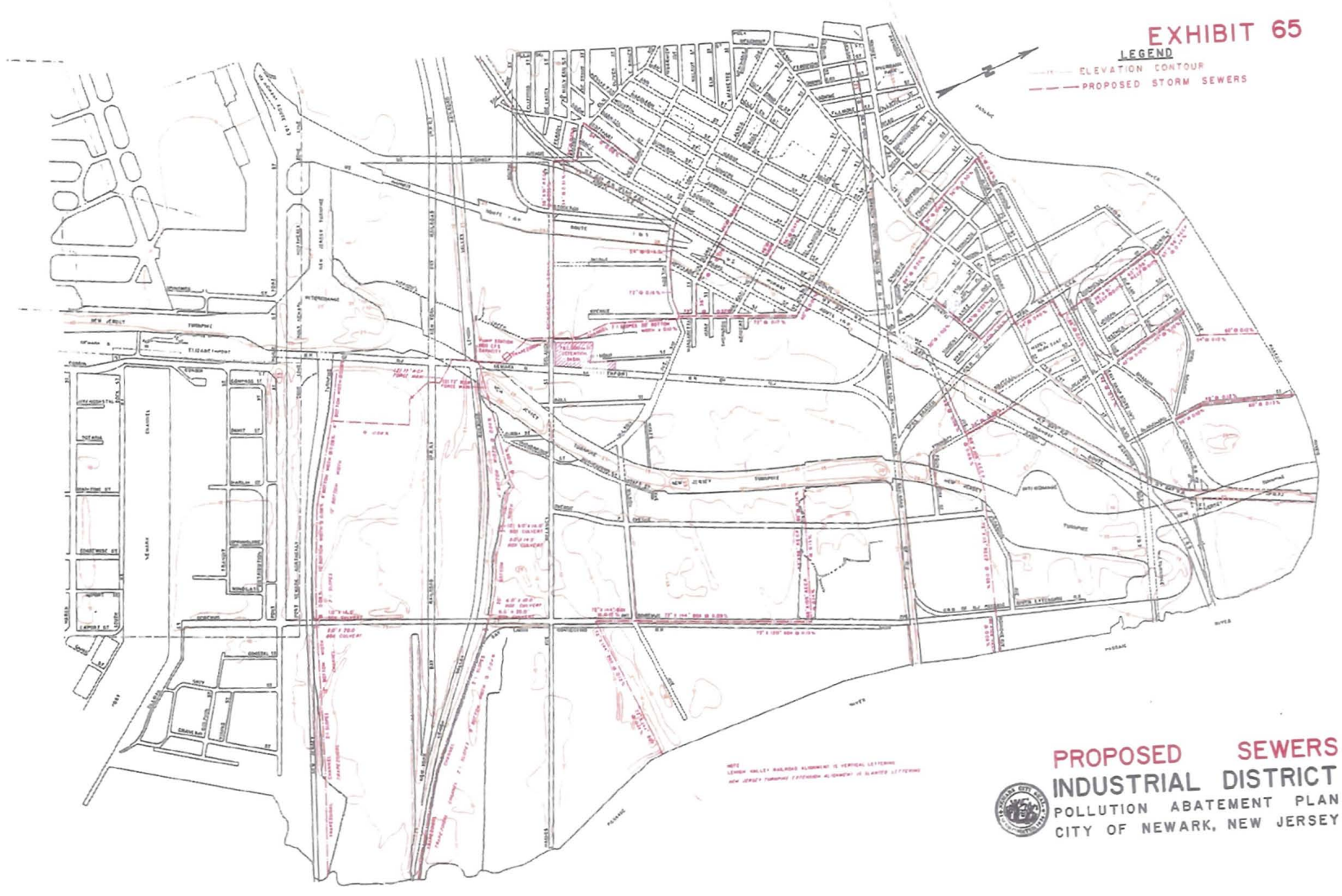
EXHIBIT 65



PROPOSED SEWERS
INDUSTRIAL DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

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Railroad. Thus, all the required rail crossings would be made by force main, which would be jacked under the rails without interrupting service. The main channel would then run south to the N.J. Turnpike Extension and along the north side of the Turnpike Extension to Newark Bay.

Since the main channel under this alignment follows the same alignment as the secondary channel under the Lehigh Valley Railroad alignment, the same design criteria were used except that the flow rate in the main channel is increased by the 600 c.f.s. from the pump station. The most satisfactory channel section was found to be a trapezoidal section with 2:1 side slopes, 12 foot bottom width, and depths of 6.7' at the terminus of the force main and 10.3' at Newark Bay. The culvert required at Doremus Avenue would be a 9' x 20' reinforced concrete box.

Under this alignment a secondary channel will be required along the north side of the Lehigh Valley Railroad to drain the areas between Wilson Avenue and the Lehigh Valley Railroad west of Doremus Avenue and between Delancy Street and the Lehigh Valley Railroad east of Doremus Avenue. (The remaining area in the southern portion of the Industrial River District will be drained by the system being designed in conjunction with the Ideal Toy Company project - See Table VII-15). This secondary channel will run from the Central Railroad to Newark Bay, and will also be a trapezoidal section with 2:1 side slopes. Since this channel follows the same alignment as the main channel under the Lehigh Valley Railroad alignment, the same design criteria were used except that the flowrates were decreased by the 600 CFS from the pump station.

TABLE VII-15

SOUTHERN PORTION OF INDUSTRIAL RIVER DISTRICT
STORM SEWERS DESIGNED IN CONJUNCTION WITH
THE IDEAL TOY COMPANY PROJECT
COST ESTIMATE

Location	Pipe Size in Inches	Estimated Cost
N.J. Turnpike-Avenue P	60	$ 95,000
Avenue P - Doremus Ave.	63 x 98	
	68 x 106	392,000
Doremus Ave.	72 x 120 Box	
	72 x 144 Box	2,167,000
Doremus Ave. - Passaic River	72 x 144 Box	1,557,000
Total		$4,211,000

The required bottom width is 4 feet from the Central Railroad to the extension of Avenue P, where two existing 60" storm sewers will discharge additional drainage from Wilson Avenue to the channel. From the extension of Avenue P to Newark Bay the required bottom width is 8 feet.

The following culverts are required for this channel.

1. A 5' x 14' reinforced concrete box culvert under the Lehigh Valley Railroad Spur

2. A 6' x 10' reinforced concrete box culvert under Doremus Avenue.

Cost estimates for the total recommended channel plan from the low point at Wilson Avenue to Newark Bay are presented on Table VII-16 for each of the alternate alignments.

TABLE VII-16

COST ESTIMATE
LEHIGH VALLEY RAILROAD ALIGNMENT

Item	Cost
1. Channel Excavation	$1,260,000
2. Detention Basin	113,000
3. 600 CFS Pump Station	1,523,000
4. Twin 72" R.C.P. Force Main	300,000
5. 5 R.C. Box Culverts; 1 at Delancy St., 2 at Doremus Ave. crossings, 2 at R.R. crossings	369,000
TOTAL	$3,565,000

NEW JERSEY TURNPIKE EXTENSION ALIGNMENT

Item	Cost
1. Channel Excavation	$1,160,000
2. Detention Basin	113,000
3. 600 CFS Pump Station	1,523,000
4. Twin 72" R.C.P. Force Main	580,000
5. 5 R.C. Box Culverts; 1 at Delancy St., 2 at Doremus Ave. crossings, 2 at R.R. crossings	267,000
TOTAL	$3,643,000

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Norther Portion of Industrial River District

The northern portion of the Industrial River District is bounded on the north and east by the Passaic River, on the south by the Central Railroad of New Jersey, and on the west by Fillmore Street. The area is presently served by several separate systems which outlet into the Passaic River.

Relief storm sewers will be required to supplement the existing facilities serving this portion of this District. The cost of these proposed storm sewers is summarized in Table VII-17.

TABLE VII-17

NORTHERN PORTION OF INDUSTRIAL RIVER DISTRICT
STORM SEWER COST ESTIMATE

Location	Pipe Size in Inches	Estimated Cost
Raymond Blvd.	54	$ 125,000
Freeman St.	36	135,000
Ferry St.	24	20,000
Christie St.	24	80,000
Brown St.	63 x 98	190,000
Lister Ave.	54 x 60	
	63 x 98	182,000
Cornelia St.	66,58 x 91	
	63 x 98	388,000
Ferry St.	54	141,000
Mfrs. Pl.	54	94,000
Horatio St.	30,48	103,000
Lockwood St.	42,54	172,000
Exit Ramp	42	70,000
Blanchard St.	36,48,60	273,000
Roanoke Ave.	48,68 x 106,	
	72 x 113	
	82 x 128	1,104,000
Foundry St.	54	133,000
Total		$3,210,000

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CHAPTER I — STUDY DETERMINANTS

GENERAL SCOPE OF STUDY

This Pollution Abatement Master Plan Study takes into consideration existing combined and sanitary sewers in the City of Newark, New Jersey. The primary emphasis of the analysis will be placed upon the sewer districts where combined sewers presently exist. As might be expected, these are the areas where the greatest need exists both from a pollution standpoint and, also, very generally, from a storm water standpoint. Two major objectives are to provide uniformity of design and, wherever possible, to integrate facilities in the process of controlling pollution and eliminating flooding within the highly urbanized City of Newark.

Newark encompasses about 24.5 square miles and has a population of about 390,000 persons. The City is one of the most densely populated in the country and experiences many of the economic and social problems common to the majority of the urban centers of our country. The great need for public services within the City has, in recent years, minimized expenditures for public works improvements.

Sewer systems in Newark were completed nearly 50 years ago, with many of them being constructed closer to 100 years ago. The craftsmanship with which these facilities were constructed is demonstrated by their longevity. However, it is unreasonable to expect that the sewers could last forever and many of these facilities can no longer accommodate present day demands. In addition, they do not conform to current standards. These inadequacies are becoming more and more apparent; hence, the reality of the situation is that *improvements to the existing sewer system within the City of Newark are urgently needed.*

Some sixty (60) percent of the surface area of Newark is presently drained by combined sewers. Current Federal and State guidelines prohibit the extension of combined sewer systems and essentially prohibit funding of projects which do not provide for either the separation of combined sewers or an alternate means of controlling the pollution that is caused by the sewers which carry combined storm and sanitary wastes. For this reason, this report concentrates on the areas of Newark which contain combined sewers. Remaining areas of Newark have also been investigated, however, to insure that the conclusions reached for the combined sewer districts are compatible with a comprehensive plan encompassing the entire sewer system within the City of Newark.

PROJECT HISTORY

The primary catalyst for the development of this work has been the *repeated flooding* and *prolonged pollution problem* which has occurred in the Newark Meadows Drainage Basin. This basin terminates in the area surrounding Newark Airport and extends west to Newark's boundary with the Town of Irvington. The drainage basin includes approximately 200 acres of the City of Elizabeth on the south and extends in a northerly direction to South Orange Avenue. There are approximately 7415 acres contained in this very highly developed drainage basin, of which one-third lies in the Meadowlands area along Newark Bay. At the borders of these meadows, extensive industrial development has occurred which has restricted the flow of storm runoff and encroached upon the natural flood plain. For several decades severe flooding conditions have existed in this area. Much of the land is well below record high tide levels and just barely above spring high tide level.

In 1961 Elson T. Killman Associates prepared a preliminary report on flooding conditions in this area which recommended the construction of a storm water pumping station to pump water against the frequent high tide levels. However, the report was concerned only with the Meadowlands and the area along Frelinghuysen Avenue where the most severe and frequent flooding occurred.

Urgent problems in the remaining areas of the City of Newark caused delay in the construction of this pump station and in 1970, when the flooding persisted, property owners brought court action against the City of Newark to eliminate this problem.

During the interim 10-12 year period, substantial changes were made in the character of the drainage basin. A Peripheral Ditch had been constructed around the Newark Airport complex and provided a new and much improved

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outfall for the majority of the drainage basin. The South Side Interceptor Sewer had also been constructed and provided an outlet for the dry weather sanitary sewage flow. Because of the continuing flooding problem and because of the major changes which had occurred in the outfall area of the basin, James P. Purcell Associates was retained to evalute the possible benefits of constructing a storm water pumping station.[13] The Purcell study not only substantiated the need for a storm water pumping station, but also determined that substantial additional improvements would be required to curtail the frequency of flooding and provide a standard degree of protection to the areas bordering the Newark Meadows.

The many economic demands of the City of Newark made it impossible for them to undertake this project on their own, so a substantial effort was made to determine possible sources of Federal and State assistance for the construction of this project. Since the area of most severe flooding was industrially zoned, an attempt was made to obtain funds from the Federal Economic Development Administration, on the premise that the elimination of the flooding problems in this area would encourage new industry to move in and create new jobs thereby justifying the allocation of EDA funds. Several meetings were held with local EDA representatives and a very optimistic view of obtaining funds was presented.

However, nearly a year later, the City was advised by EDA regional representatives that the EDA could not provide funds until the project had been approved by the Environmental Protection Agency. To satisfy this requirement a Certification of Adequacy of Treatment had to be obtained from the EPA. After much discussion it was established that the Certification would be issued if the following conditions were met:

1. The City of Newark must develop a Basin Master Plan defining an overall comprehensive project which would be designed to eliminate the discharge of combined sewage into Newark Bay.

2. The City must provide a detailed project staging schedule for the overall program.

3. The City must begin the implementation of the project outlined in the Basin Master Plan.

It was thus apparent that to obtain Federal funds for the construction of a storm water pumping station which was within a combined sewer district, it would be necessary to implement an overall pollution abatement plan which could result in a very large expenditure of City, State and Federal funds. Thus, in an effort to keep moving ahead with this project, the City of Newark funded a study to prepare the Basin Master Plan, with the hope that the cost of the Study would be reimbursed by EDA. It was agreed that a comprehensive Master Plan for the entire City of Newark would be more appropriate than just a study for the Newark Meadows Basin. James P. Purcell Associates was therefore retained to prepare a Pollution Abatement Master Plan for the City of Newark which would also include major sections dealing with the solution of the major flooding problems occurring within the City, and thereby fulfill the Basin Master Plan requirements of the Environmental Protection Agency.

To expedite the badly needed storm drainage improvement for the Newark Meadowlands Basin, an Interim Report was published for that particular Basin in April of 1972. This interim report recognized the need for extensive improvements, including a means of solving the pollution caused by the combined sewer overflows, and met the requirements of the Federal Environmental Protection Agency with regard to both the required Basin Master Plan and the establishment of a project staging schedule. The final requirement of EPA prior to the issuance of a Certification for the Adequacy of Treatment was the initiation of construction of that project. In April of 1973 the Adams Street Sanitary Sewer and Storm Sewer Cleaning Project was advertised and bids were taken. Implementation of this project satisfied the final requirement of EPA.

However, in the interim period the Economic Development Administration has been disbanded, and this source of funds is no longer available to the City of Newark.

The New Jersey Department of Transportation was also approached for assistance and was requested to contribute to the reconstruction of Frelinghuysen Avenue and the associated reconstruction of drainage facilities. In this case, local New Jersey Department of Transportation representatives reacted favorably to the possibility of obtaining State participation in the construction of this project. Early in 1972, after nearly a year of discussions the State's participation in the project was verbally confirmed, contingent upon the execution of a contractual agreement between the City of Newark and James P. Purcell Associates, and an early completion of the design of the project (by July 1, 1972). Since State funds were involved in this project the final draft contract was forwarded to the State for

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their approval, but in April, 1972 the State Department of Transportation informed the City that funds were not available and, that even if they were, it was very questionable whether the State could participate in the proposed project.

The preceeding discussion highlights the fact that although many agencies appear willing to assist the City of Newark, no final commitments have been forthcoming. The Port Authority of New York and New Jersey, which has a major interest and responsibility in the program area has cooperated to a point, but no other agency, either State or Federal, has displayed continuing interest in providing financial assistance.

PASSAIC RIVER AND NEWARK BAY

The Passaic River is one of the largest rivers lying within New Jersey. It drains about 935 square miles which lie essentially in New Jersey with but a small portion in New York State. The upper areas of the watershed are rather sparsely inhabited with most of the land area being undeveloped. The population centers of the State bordering the Hudson, Hackensack and Passaic Rivers depend primarily upon this upper watershed for potable water supplies, and Jersey City, Newark and the Passaic Valley Water Commission presently have rights to over 200 m.g.d. from the Passaic River system. In spite of the numerous reservoirs which have been developed on the upper branches of the Passaic, extreme flooding conditions still occur.

The Passaic River winds its way out of the highlands into the more intensely developed areas of eastern Morris County and western Union and Essex Counties. Where the main stem of the river flows through the areas of Berkeley Heights, Madison, Chatham and Summit, the velocity decreases quite significantly and water quality starts to become a problem. The quality of the Passaic River continues to decline through the reaches to the Two Bridges area, Little Falls and Paterson where the river truly becomes an open sewer. These lower reaches of the Passaic River have been classified as one of the 10 dirtiest rivers in the Country.

The Corps of Engineers has been studying the Passaic River for approximately 30 years. Several reports have been written and several plans have been adopted and then discarded for one reason or another. Basically the Corps of Engineers current plan calls for the construction of flood control reservoirs at Myers Road in Passaic Township, Morris County, and at Two Bridges on the Morris and Passaic County lines. Downstream of the Two Bridges reservoir extensive channel improvements and protective facilities are planned to control flooding of the river.

The City of Newark generally rises very quickly above the Passaic River, and flood flows from the River have only a minor effect upon flooding in the City and in backing up the City outlet sewers. The greatest problem for the City of Newark is the high tide occurring in Newark Bay. These high tide levels back up the drainage systems in the Industrial River, Peddie, Queen, Waverly, Wheeler and Adams Districts. These districts are located in the eastern part of the City and drain into Newark Bay either directly or through the Peripheral Ditch System. The Corps of Engineers has prepared preliminary plans for major flood control dikes and pumping stations along reaches of the Passaic River in the City of Newark. The primary function of these facilities will be to protect the Industrial River District against extreme high tides, and the storm water pumping stations will be utilized to pump storm water runoff into the river against the high tide stages. A more complete discussion of these facilities follows in a subsequent section of the report.

In summary, although the Passaic River has been labeled as a major concern from a flooding standpoint, its effect upon the flooding in the City of Newark is minimal. The high tide stages in Newark Bay certainly have a much more significant effect upon the drainage of the eastern areas of the City of Newark.

THE PERIPHERAL DITCH

The most significant facility in the Newark Meadows basin from a drainage standpoint is the Peripheral Ditch. It is the single outlet for this 7,415 acre watershed and is therefore the key to the drainage basin.

The Port Authority of New York and New Jersey, within the scope of their master development plan for Newark Airport, completed the construction of the Peripheral Ditch in 1965. This ditch which forms a moat around the Airport facility, is 80 feet wide at the base, with sides sloping at a ratio of 3 horizontal to 1 vertical. The average depth is approximately 8 feet with an invert slope of 0.000156 feet per foot. In Newark, the Peripheral Ditch follows a course parallel to U.S. Route 1-9, approximately 600 feet to the east of it.

In Elizabeth, it follows a course parallel to and north of North Avenue in an easterly direction, then it swings northerly toward the New Jersey Turnpike

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and runs parallel to the west side of the Turnpike to the Newark-Elizabeth boundary line, where it joins the old Bound Creek.

The Peripheral Ditch cuts and replaces the former alignment of the Adams, Waverly and Peddie Ditches within the meadows. Some sections of these ditches have been back-filled and realigned and are connected to the Peripheral Ditch at various points.

The Peripheral Ditch carries all of the runoff of the Newark Meadows Basin and discharges it into Bound Creek which in turn discharges into Elizabeth Channel in Newark Bay. Combined sewer flow from the Newark area enters the Ditch at Peddie, Adams, Herring and Waverly Connections. The storm flow from the City of Elizabeth enters the Ditch at Alina and North Avenue Connections.

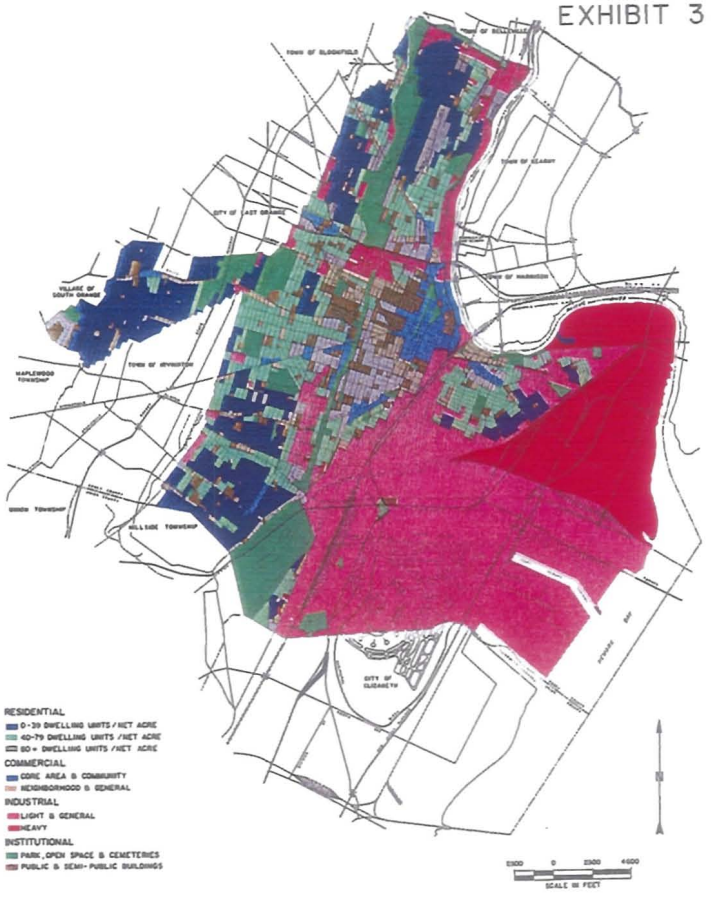
PRESENT LAND USE

The present land use pattern in the City of Newark is typical of most old cities in the Metropolitan New York area. The early development within the City occurred without a plan of land use which led to quite spotty development. Through the years new land use plans have been adopted which have been forced of necessity to generally conform to the existing uses. Minor adjustments have been made to try to encourage more appropriate development in certain areas but this has not always been successful.

The land use plan presented on Exhibit 3 is taken from the 1965 City of Newark Master Plan. A few major revisions to that Master Plan have been adopted by the City Council and these changes have been incorporated into the plan presented on Exhibit 3. In the analysis of the hydraulic needs of some of the existing City zones, it was found that there were only minor differences in needs between some of the land use distinctions made in the Master Plan. Therefore, several of these zones with similar characteristics have been combined. This map should not be utilized as a key to exact zoning but rather as an indication of land use with a common demand on sanitary and storm sewers.

The City development is presently controlled by a zoning ordinance which defines four intensities of residential, four intensities of commercial, and three intensities of industrial land use. The residential development is primarily in the northern and western or higher elevation areas of the City. The heavy industrial development is located along the Passaic River and Newark

EXHIBIT 3



LAND USE PLAN

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Bay. The commercial core of the City is located in the central area of the City lying in the Raymond-Saybrook Districts. In addition to the heavy industrial utilization of the eastern areas of the City, Newark Airport, which is operated by the Port Authority of New York and New Jersey, occupies a major area of the City of Newark. The recent airport expansion program converted great areas of marshland to this major transportation center. This complex will eventually encompass 1,850 acres. Table I-1 presents a tabulation of the land use within the Newark Meadows Drainage Basin. As can be seen from this table, a wide variation in land use does occur within that Basin.

GENERAL TOPOGRAPHY AND GEOLOGY

The City of Newark is located at the outfall of the Passaic River into Newark Bay, which in turn discharges into Lower New York Bay. The major portion of the City is founded on relatively high hills ranging up to an elevation of 225 feet above mean sea level, and the northern area of the City along the Passaic River rises quite steeply from the river. Approximately one-third of Newark, however, is located in the low meadowlands which border the Bay.

Because of the extensive development of the City, very little of the natural geology of the area is visible from the ground surface. The higher elevations generally consist of unconsolidated sedimentary deposits on top of sandstone. In some areas the sandstone is at quite shallow depths and would be encountered in the installation of hydraulic utilities. However, the soils plans and profiles shown on Exhibits 4 thru 9 indicate that the sandstone in the upper areas of the City generally is overlain by 10 to 30 feet of unconsolidated material. The unconsolidated material ranges from sand to silty sand and clays. Sand with relatively good bearing capacities is the most prevalent material; however, in some areas poor foundation conditions will probably be encountered and corrective measures will have to be taken to ensure proper installation of hydraulic utilities.

In the lower areas of the City along the Meadowlands, the depth of the consolidated material is quite a bit greater. At elevations ranging from 10 feet to 30 feet below mean sea level relatively dense sand would generally be encountered. In some areas this sand is mixed with traces of clay. The bearing capacity of this material is generally adequate for light load spread footings. However, recent installations of several large storm sewers in this area required the over-excavation of poor material down to this relatively dense

TABLE I-1

BASIN LAND USE

District	Parks, Open Spaces Cemetery	Residential	Industrial	Commercial	Total
To Peddie Connections			Area in Acres		
A. Peddie District	65	845	330	640	1,880
B. Wheeler District	4	141	182	113	440
C. Queens District	95	67	165	8	335
D. Queens District-(Weequahic Lake)	381	64	36	1	482
E. Peddie—Queen Outlet District	-	-	185	-	185
SUB-TOTAL	545	1,117	898	762	3,322
To Adams Connection					
A. Adams District	8	62	294	56	420
B. Lower Adams District	255	-	100	-	355
SUB-TOTAL	263	62	394	56	775
To Waverly Connection					
A. Waverly District	46	58	200	-	304
B. Waverly District (Elizabeth)	-	12	39	1	52
C. Herring Meadows	28	-	88	-	116
SUB-TOTAL	74	70	327	1	472
To Airport Connection					
A. North Airport District	200	-	-	335	535
B. West Airport District	50	-	-	325	375
C. South Airport District	233	-	100	-	333
D. East Airport District	490	-	120	-	610
SUB-TOTAL	973	-	220	660	1,853
To Elizabeth Connection					
A. Alina District (Elizabeth)	10	94	18	16	138
B. Fairmont District (Elizabeth)	9	476	211	159	855
SUB-TOTAL	19	570	229	175	993
TOTAL	1,874	1,819	2,068	1,654	7,415
PERCENTAGE	25.27%	24.53%	27.89%	22.31%	100.0%

KLL010528

sand and backfilling with crushed stone to provide an adequate foundation for the drainage facilities. The upper layer of the material in the Meadowlands area is generally a black peat ranging in depth from approximately 8 feet on the border of the Meadow area to 20 to 30 feet in the areas closer to Newark Bay.

In summary, the geology of Newark generally indicates that in the higher elevations installation of hydraulic facilities can be accomplished with a minimum of difficulty. However, in the Meadowland areas, it must be anticipated that foundation problems will be present and that over-excavation or piles may be required.

EXHIBIT 4

BORING LOCATIONS

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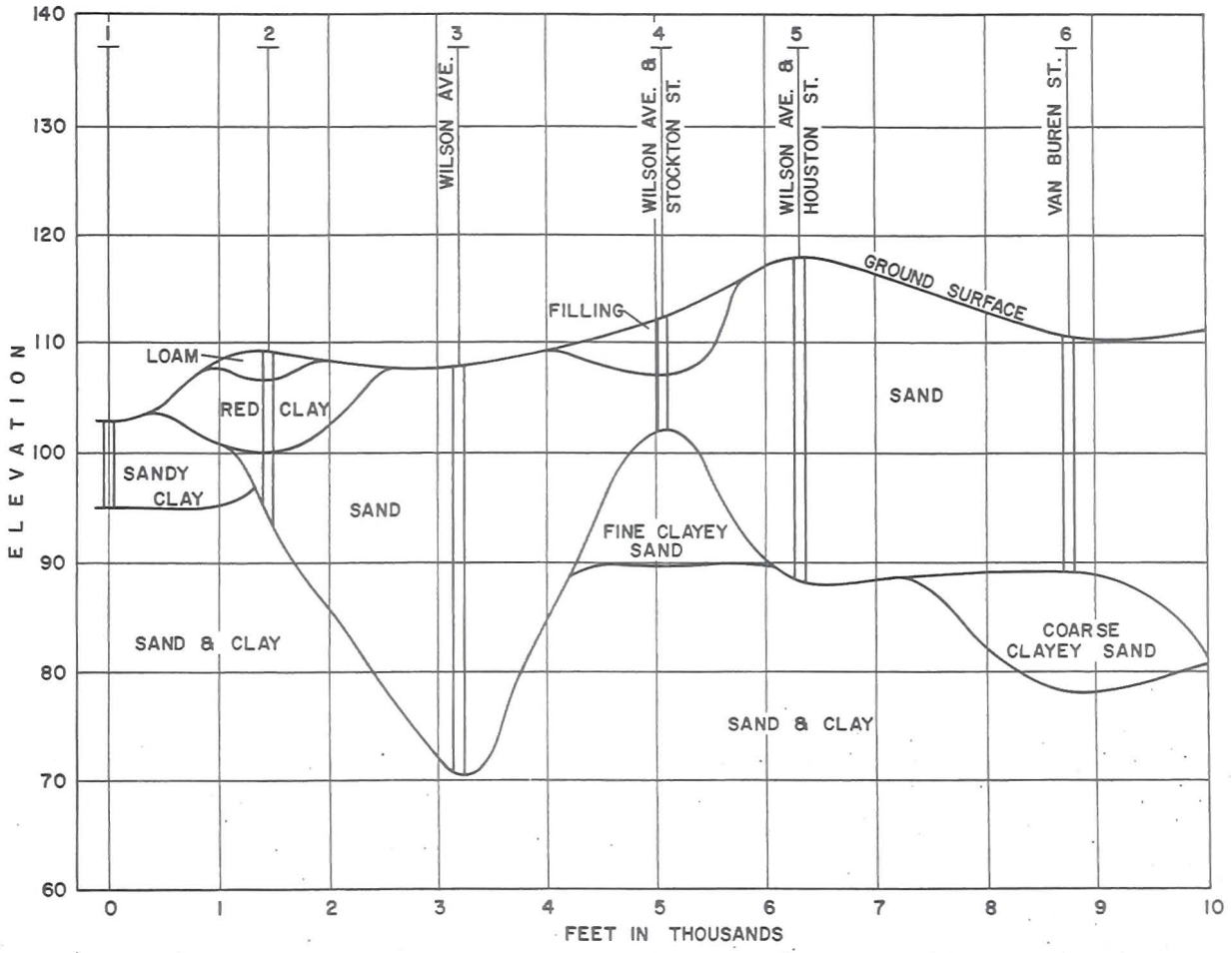
EXHIBIT 5



SUBSURFACE SECTION A-A(1)

NOTE:
ELEVATION DATUM
100'= MEAN SEA LEVEL

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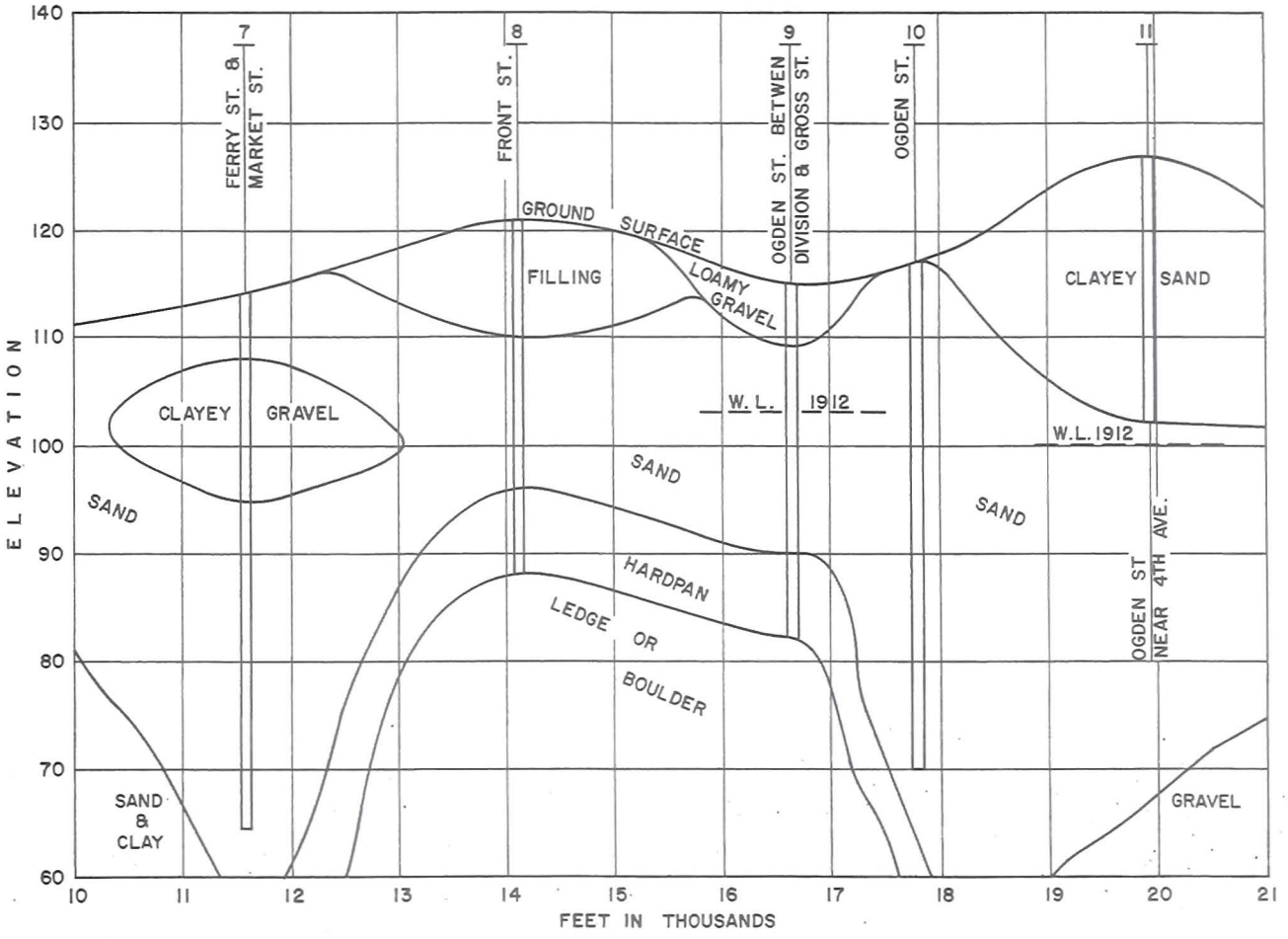
EXHIBIT 6



NOTE:
ELEVATION DATUM
100' = MEAN SEA LEVEL

SUBSURFACE SECTION A-A (2)

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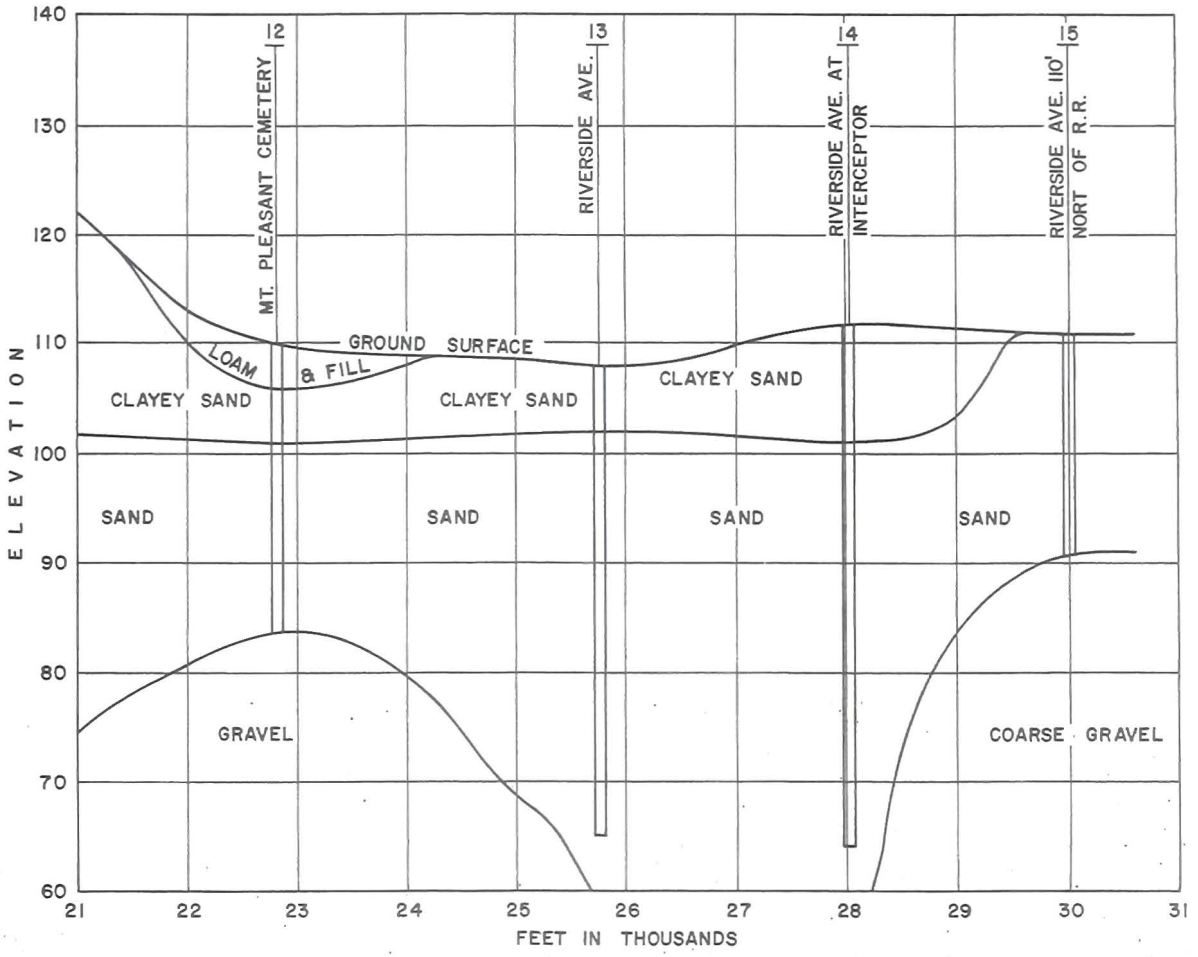
EXHIBIT 7



SUBSURFACE SECTION A-A (3)

NOTE:
ELEVATION DATUM
100'= MEAN SEA LEVEL

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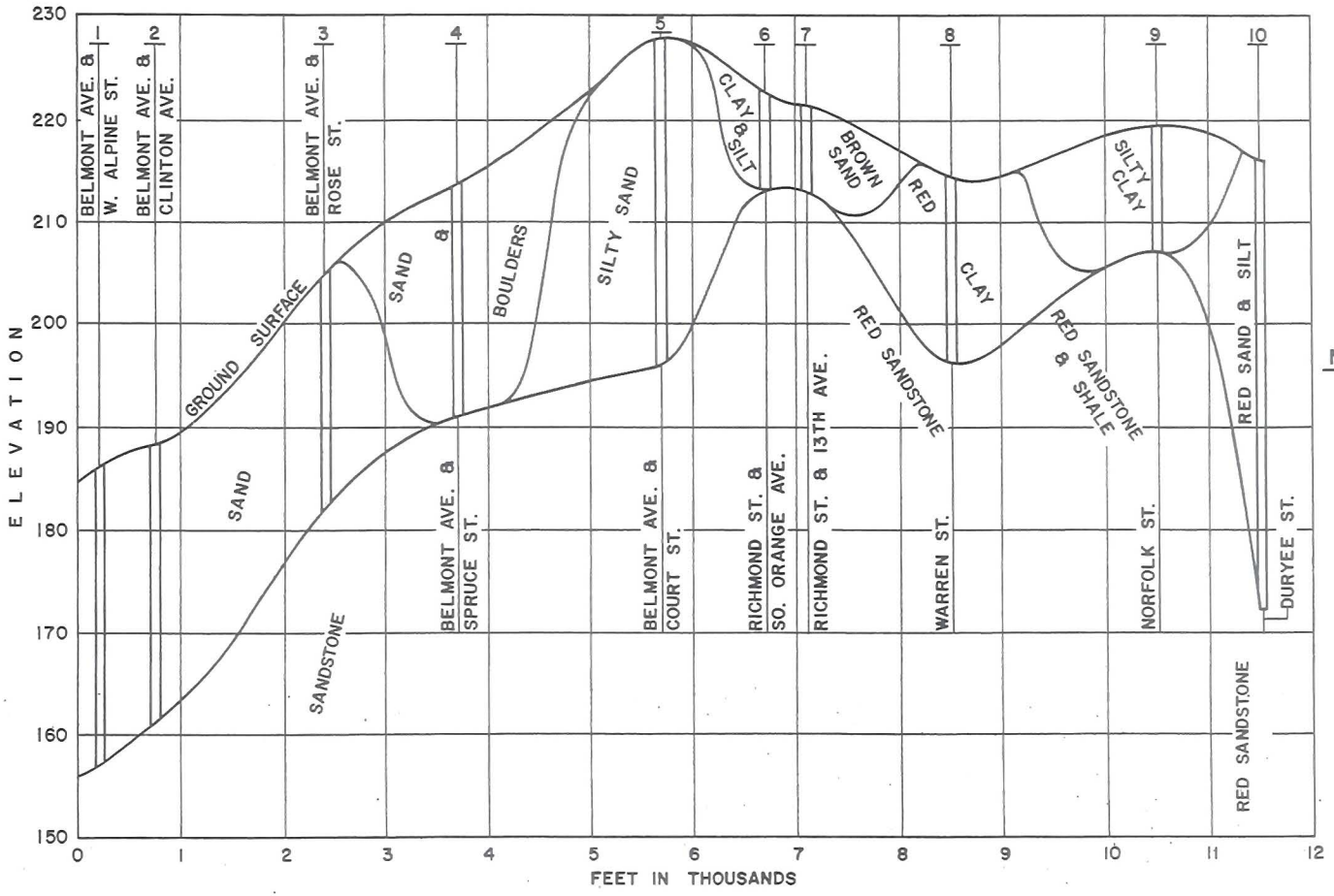
EXHIBIT 8

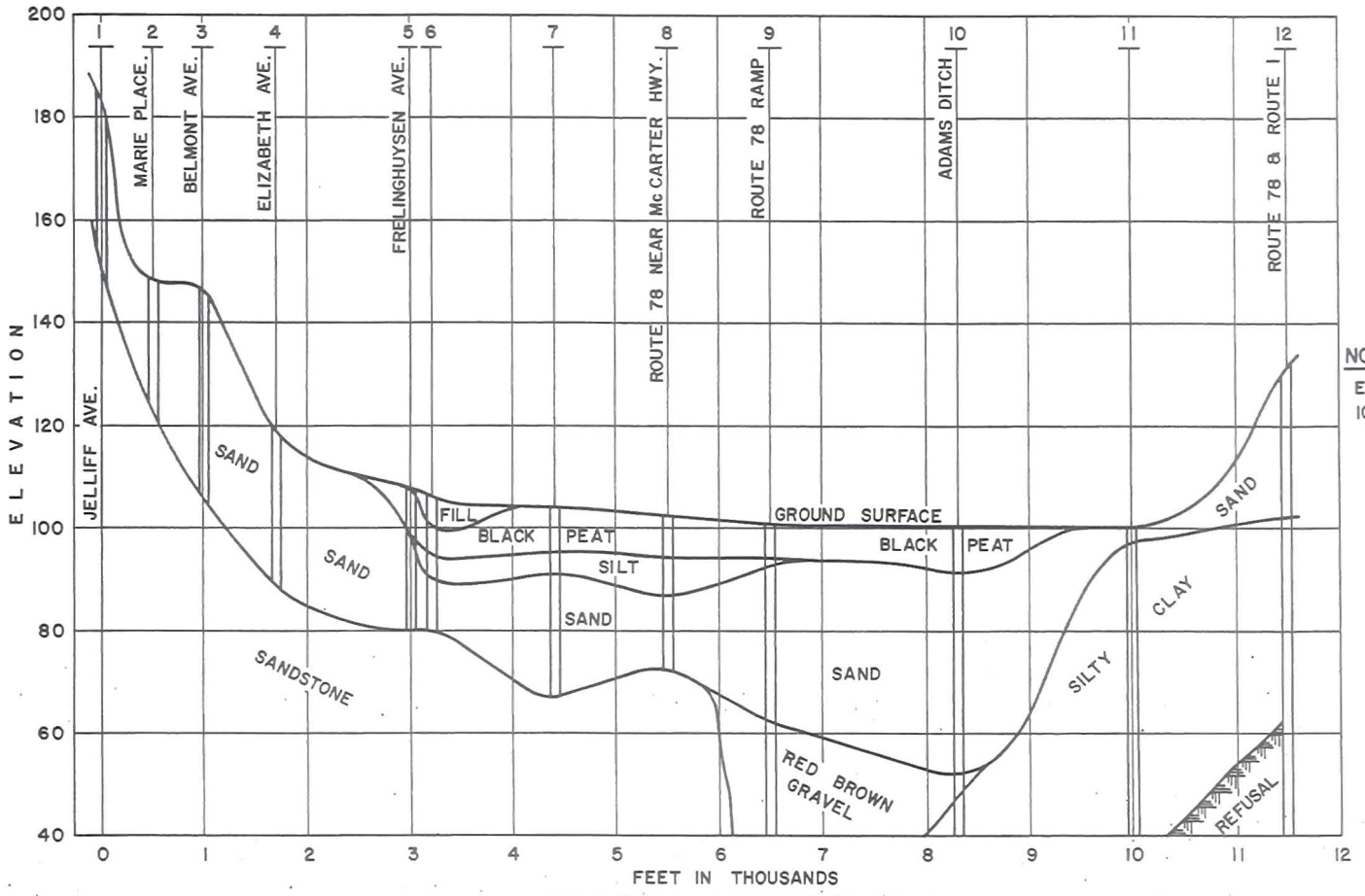


NOTE:
ELEVATION DATUM
100' = MEAN SEA LEVEL

SUBSURFACE SECTION B-B

KLL010533

EXHIBIT 9



NOTE:
ELEVATION DATUM
100' = MEAN SEA LEVEL

SUBSURFACE SECTION C-C

KLL010534

CHAPTER II — COMBINED SEWER DISTRICTS

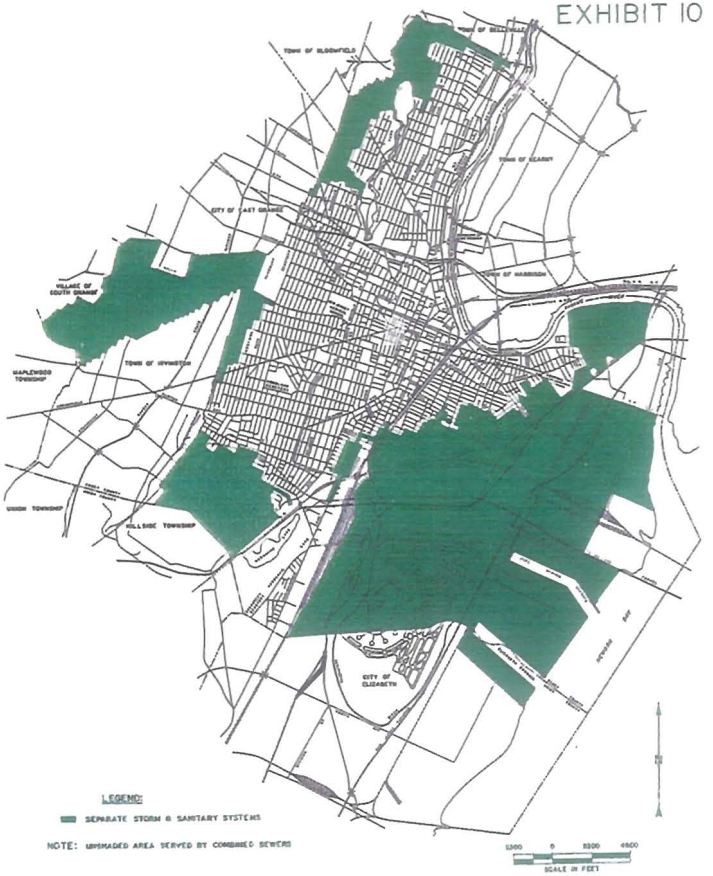
Exhibit 10 presents the areas of the City of Newark which are served by separate storm and sanitary sewers. The shaded areas are served by the separate systems and the unshaded areas are served by combined sewers.

The largest area which is presently served by a separate sewerage system is the industrial and airport area. Storm drainage from the area between the Passaic River and the Pennsylvania Railroad drains to Newark Bay and the sanitary sewage from these districts is conducted to the Passaic Valley Sewerage Authority treatment facility on Doremus Avenue. Sanitary sewage from the Port Newark area east of the New Jersey Turnpike is collected in a gravity system and then pumped across the Doremus Avenue Bridge to the Passaic Valley Treatment Plant. The new airport terminal areas drain to the South Side Interceptor Sewer in the vicinity of McClellan Street.

The industrial areas along Frelinghuysen Avenue and South Street are included in a separated sewer area but are not effectively separated at all times. During a heavy rain the sanitary sewer will become overloaded and back up into the storm sewer system which will then convey the combined waste into the drainage system around Newark Airport. Extensive storm drainage improvements will be required to collect the storm drainage and prevent its surcharging of the sanitary sewer in South Street. Thus, even though this district is served by a separate sewage system, there are occasions when the sanitary waste will mix with the storm waste and discharge into Newark Bay. Areas such as this have been given extensive consideration in this report.

The southwesterly section of Newark along the Hillside Township boundary is also provided with separate storm and sanitary sewers. A portion of the storm drainage for this area goes into Hillside Township and then drains into the Elizabeth River. The remaining areas drain into local storm sewers which flow down to Meeker Avenue and eventually drain into the Peripheral Ditch. The sanitary flow which is generated along the western Newark boundary with the Town of Irvington drains to the Elizabeth Joint Meeting treatment facilities. This treatment plant is located near the mouth of the Elizabeth River in the City of Elizabeth.

EXHIBIT 10



EXISTING SEPARATE SEWER SYSTEMS

POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

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The eastern section of this drainage district, the Queen District, is served by separate systems, but the sanitary sewers connect back into the combined sewers in Meeker Avenue. Thus, although some portions of this watershed are provided with separate sewage systems the collected sanitary waste is discharged into the combined sewers which, during periods of intense rainfall will be discharged into the ditch systems surrounding Newark Airport.

The westernmost area of the City of Newark, the Vailsburg District, is also served by separate storm and sanitary sewer systems. This entire area is in the Elizabeth River watershed and storm drainage collected in this system is discharged into that river. Much of the drainage from the City of East Orange to the north drains through Vailsburg into the Town of Irvington on the south and then into the Elizabeth River. The sewer separation in this district is reasonably effective. There are, however, a few locations where storm drainage is inadequate and minor local flooding occurs.

The last district of the City which is served by separate sewerage systems is in the northern area of the City along the Bloomfield-Belleville boundary. Sanitary waste in this district drains into the Second River Joint Meeting Trunk Sewer which parallels the Second River. There have been some problems with the Second River Joint Meeting Trunk Sewer in the recent past which required emergency repairs, but in general the separation of this area seems to be quite efficient with few reported incidents of sanitary sewage overflows.

PASSAIC VALLEY SEWERAGE COMMISSIONERS

The Passaic Valley Sewerage Commissioners is one of the largest authorities in the country and collects and treats the flow from 30 municipalities extending from Glen Rock and Paterson south to Newark. Interceptor sewers extend the full length of this 25 mile reach of the Passaic River. During 1974, the average daily flow through the treatment plant was 244 mgd, with an average peak of 384 mgd. The effluent from the primary treatment plant located on Doremus Avenue in the City of Newark is discharged directly into the lower New York Bay through an outfall tunnel which runs beneath Newark Bay and the City of Bayonne. The existing collection system and treatment plant is quite outdated and a very extensive improvement program is presently underway.

Phase I of this program, which was recently completed, provided a new coarse screen, aerated oil and grease removal facilities, a fine screen, new grit chambers, an incinerator and a control and laboratory building. These facilities make possible the passage of even larger flows through the treatment plant but effect only a minor increase in overall treatment efficiency. Phase II calls for the installation of new chlorination facilities and a detailed investigation of possible processes to upgrade the present treatment plant to secondary effluent quality. After intensive testing of the conventional activated sludge process, bio-disc, the unox system (direct oxygen contact), flow core (plastic media filtration), and the Z-M process (physical chemical treatment), the unox process has been selected for design development.

In addition to the responsibility of collecting and treating domestic and industrial sewage, the Passaic Valley Sewerage Commissioners are also charged with maintaining the overall quality of the Passaic River between Paterson and Newark Bay. They have a rather extensive program of water quality sampling and analysis and have made great efforts to locate sources of pollution entering the river. In 1972, 1500 questionnaires were sent out to industries within this drainage system requesting information on the quality and quantity of the effluents discharged by the industries. The responses from industries within the City of Newark will be analyzed later in this report.

Future improvement programs call for a study and evaluation of the relative merits of constructing either a relief interceptor sewer from Paterson to the present treatment plant site or a new tertiary treatment plant at Yantacaw Brook in the Clifton area. Future plans also call for the installation of automatic quality monitoring devices in the Passaic River and the evaluation of possible storm water overflow treatment facilities. Many of the municipalities tributary to the Passaic Valley Sewerage Commissioners system have combined sewers.

Table II-1 contains an analysis of the existing City of Newark connections to the Passaic Valley Sewerage Commissioners Interceptor Sewers. This table defines the location of each major connection, the type of structure, the size of the Passaic Valley Interceptor Sewer, and its invert elevation, the size and invert elevation of the Newark Sewer and a brief description of the major characteristics of the diversion regulating chamber. Many of the City of

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TABLE II-1

EXISTING SEWER CONNECTIONS TO PVSC INTERCEPTORS

Location of Connection	Type of Structure	Interceptor Size	Interceptor Inv. Elev.	Incoming Sewer Size	Incoming Sewer Inv. Elev.	Remarks
I. South Side Interceptor						
1. Waverly District Outfall	Diversion Chamber	54" RCP	93.41	96"	100.20	Regulator, float operated, is 47-7/8" x 28" Brown & Brown. Gate Metering facility is Parshall Flume with 2'0" wide throat and equipped with flow and level record.
2. Queen District Outfall	Diversion Chamber	66" RCP 54" RCP	89.92 90.92	5' x 8.5' Box Sewer	99.10	Regulator, float generated, is 47-7/8" x 21" Brown & Brown. Gate metering facility is Parshall Flume with 1'6" wide throat equipped with flow and level recorder.
3. Peddie District Outfall	Diversion Chamber	84" RCP 66" RCP	87.50 89.00	6' x 12' 6' x 16'	96.91 96.91	Regulator, float operated, is 47-7/8" x 28" Brown & Brown. Gate metering facility is a Parshall Flume with 2'0" wide throat equipped with flow and level recorder.
II. Main Interceptor						
1. Avenue P		12' 6" RCP	76.42	48"		At the vicinity of New Jersey Turnpike overpass between Curry and Hyatt (1955).
2. Avenue P	Manhole	12' 6" RCP	76.56	24"	87.67*	
3. Wilson Avenue	Manhole	12' 6" RCP	76.64	15"		
4. Wilson Avenue	Manhole	12' 6" RCP	76.78	12"		
3. Freeman Street	Diversion Chamber	24"	92.66	2'6"x3'6"	99.42	Regulator, float operated, is 18" Dia. sewage flap gate.
4. Polk Street	Diversion Structure	48"	87 91	8'0"x7'0"	96.19	Regulator, float operated, is 18" flap gate type.
5. Jackson Street	Diversion Structure	5'4"	87.15	4'10"x5'2"	96.70	Dry weather flow from this chamber combines with sewage from Kearny & Harrison Townships. Regulator, float operated is 18" sewage flap gate type. No metering devices.
6. Raymond Plaza-East	Diversion Chamber	11'9" RCP	80.66	9' x 7'6"	96.14	9'0" circular siphon carries combined flow below subway extension. Water rises to outlet siphon chamber and at low flow goes to the PVSC sewer; otherwise diverted to the river by regulating devices. Regulator, double-float operated, is 18" x 42" castings. No metering devices.
7. Saybrook Place and Rector Street	Diversion Chamber	11'9" RCP	81.36	75" RCP From Saybrook Pl. 60" RCP From Rector St.	101.54 103.37	Regulator, for Saybrook Place, float operated, is 15" x 42" sewage gate while that of Rector is 12" x 36" Gate. The sanitary discharge from Rector Street chamber combines with the Saybrook at a common connection with the Interceptor. Both have no metering devices.

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TABLE II-1 (Continued)

Location of Connection	Type of Structure	Interceptor Size	Interceptor Inv. Elev.	Incoming Sewer Size	Incoming Sewer Inv. Elev.	Remarks
5. Avenue L	Manhole	12'6" RCP	77.49	15"	94.80*	Connection to PVSC Main Interceptor with 12" C.I. Pipe in 1958. No metering devices.
6. Avenue K	Manhole	12'9" RCP	78.00	15"	96.23*	Connection to PVSC Main Interceptor with 12" C.I. Pipe April, 1967. No metering devices.
III. Jabez St.-Wheeler Point Rd. Branch Interceptor						
1. Avenue I	Chamber	4'9"	85.17	3'6" x 4'10"	91.75	Existing 3'6" x 4'10" brick sewer is sealed after the chamber and flows upstream; is conveyed to interceptor.
2. South Bay Avenue	Diversion Chamber	4'9"	91.08	6'4"	90.20	Existing 6'4" on S. Bay Avenue below chamber is sealed off after the City abandoned South Street Pumping Station. Regulating devices were also removed.
IV. Brown Street Branch Interceptor						
1. Brown Street	Diversion Chamber	24"	99.01	24"	100.96	Existing chamber is now sealed off and its regulating devices removed. Separate 24" storm line serves this area now.
2. Raymond Boulevard	Manhole	24"	95.82	10"		10" connection carries sewage only. Manhole is located at the vicinity of C.R.R.N.J.
8. Bridge Street	Diversion Chamber	11'3" RCP	82.26	15" VP	107.10	Regulator, float operated, is 10" x 20" sewage gate. No metering devices.
9. Orange Street	Diversion Chamber	11'3" RCP	82.40	15" 18" VP 6" VP	106.70 106.50 106.80	Regulator, float operated, is 10" x 20" sewage gate. No metering devices.
10. Clay Street	Diversion Chamber	11'3"	82.86	2-3'3" x 6'9"	101.57 No. 101.62 So.	This chamber receives the dry weather flow from the Ogden, Clark, and Passaic Street regulators. The chamber is provided with overflow weir. No metering facility.
11. Ogden Street	Diversion Chamber	11'3"	82.86	15"	104.42	The chamber receives the combined flow from the sewer along McCarter Highway. Regulator, float operated, is 10" x 20" sewage gate. No metering device.
12. Passaic Street	Diversion Chamber	11'3"	82.86	18"	102.39	The flow out of this chamber combined with those from Ogden Street Diversion Chamber for conveyance to a common sewer connection with the PVSC. Regulator, float operated, is 10" x 20" sewage gate. No metering devices.
13. Clark Street	Diversion Chamber	11'3"	83.05	24" x 36" 12"	108.55	Dry weather flow from this chamber discharges into the Passaic Street Diversion Chamber. The regulator, float operated, is 10" x 20" sewage gate. No metering devices.

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TABLE II-1 (Continued)

Location of Connection	Type of Structure	Interceptor Size	Interceptor Inv. Elev.	Incoming Sewer Size	Incoming Sewer Inv. Elev.	Remarks
14. Fourth Avenue	Diversion Chamber	11'3"	83.60	2'8" x 4'	100.81	The regulator, float operated, is 12" x 36" sewage gate. No metering facility. Dry weather flow combines with those from Third Avenue for a common connection with the PVSC Interceptor.
15. Third Avenue	Diversion Chamber	11'3"	83.79	15"	102.12	Regulator, float operated, is 10" x 20" sewage gate. No metering devices.
16. Herbert Place	Diversion Chamber	11'0"	84.59	42" x 48" 15" VTP	105.33 104.00	Regulator, float operated, is a 12" x 36" sewage gate. No metering devices.
17. Delavan Street	Diversion Chamber	10'6"	85.34	12"	88.12"	18" regulator gate, float operated, has been removed. No metering devices.
18. Bishop Walsh Housing Development	Manhole	10'6" Flat Arch	86.06	---	---	3-shaft manholes at different point at the back of this housing development was used for connection.
19. Verona Avenue	Diversion Chamber	10'6"	86.28	4'7"	101.90	Regulator is made of overflow concrete weir type. No metering facility.
20. Second River	Venturi Meter	10'6"	86.55	Flow coming from Belleville		Metering facility is a Venturi Meter which measures the flow from the adjacent communities served by the Interceptor.
21. Second River (Union Outlet)	Venturi Meter	10'6"	86.53	48"	104.77	Metering facility is a 60" x 30" Venturi tube.

Newark sewers existed prior to the construction of the Passaic Valley Sewerage Commissioners facilities and when the Passaic Valley Interceptor was constructed the existing lines along its alignment were simply connected to it. Little maintenance is provided for these facilities and at times they have been known to malfunction and discharge sanitary waste directly into the river even at low flow periods. One aspect of this report will deal with means to reduce the number of these connections and to insure their efficient operation.

Table II-1 is essentially self-explanatory. The description presented in the column titled Type of Structure define the physical means by which the Newark City Sewer is connected to the PVSC Interceptor. The connections made with diversion chambers are designed so that dry weather flow will pass into the Interceptor sewer generally through a control gate. When the flow exceeds a certain limit the gate is closed by a float and the combined sewage is diverted to a storm drainage outfall. The connections described as direct connection or manhole provide only for flow into the Interceptor sewer and no bypass is provided.

SOUTH SIDE INTERCEPTOR

In 1965 the South Side Interceptor was constructed to convey all the sanitary waste water from the Peddie, Queen and Waverly Districts to the Passaic Valley Sewerage Commissioners Treatment Plant located on Doremus Avenue.

The maximum carrying capacity of this interceptor is 125 c.f.s. but the amount accepted for treatment by the Commissioners under their agreement with the City of Newark is only 93 cfs or 60 mgd. This restriction was imposed because of the limited capacity of the inlet (Head End) facilities of the PVSC Treatment Plant. A recent expansion of the capacity of the inlet facilities will enable the treatment plant to ultimately accept the full capacity of the trunk sewers.

The Peddie, Queens and Waverly Outlets are the three major connections to the South Side Interceptor. Each of these connections has a diversion structure which automatically limits the volume of waste water going to the

KLL010539

plant. The total capacity of the 3 combined sewer trunks is 1270 cfs, of which only 93 cfs (or 7%) could possibly be carried by the South Side Interceptor Sewer. Any flow in excess of 93 cfs together with the flows from Wheeler Ditch, Adams Ditch, the Airport and the City of Elizabeth, are conveyed directly to Newark Bay by the Peripheral Ditch.

FLOOD PRONE AREAS

Exhibit 11 entitled Flood Prone Areas delineates the areas of the City of Newark which are frequently flooded. The information presented on Exhibit 11 was collected by Purcell Associates personnel during the course of this project and supplemented by data from the City of Newark, Bureau of Sewers. Relative to this problem the project timing was quite good in that several very extreme storms occurred during our study period. Upon reviewing Exhibit 11, it immediately becomes obvious that the worst problem areas border the Newark Meadowlands. Frelinghuysen Avenue, Meeker Avenue and South Street very frequently flood to depths great enough to prohibit automobile and sometimes even truck travel on the roadways. This depth of water is sufficient to cover the first floors of numerous buildings with 1 to 2 feet of water. The frequent flooding of these areas has truly inhibited industrial development in these locations. In addition to the area surrounding Newark Meadows, the industrial areas on Wilson Avenue and Doremus Avenue have also experienced frequent and severe inundation. The flooding of both the areas surrounding the Meadows and the industrial district is generally caused by three conditions:

1. Inadequate size of the existing drainage facilities;
2. The areas are all relatively low and are vulnerable to high tide levels in Newark Bay;
3. In the past the drainage facilities were not adequately maintained.

Each of these flood prone areas will be discussed in detail later in this report. However, Exhibit 11 amply demonstrates that the Newark Meadows Basin was rightfully given top priority by the Interim Report and it will again be given a great deal of attention in this report.

SILTED SEWERS

Extensive field investigations were conducted by Purcell Associates' personnel and by the employees of the City Bureau of Sewers to determine the

EXHIBIT II

FLOOD PRONE AREAS
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

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overall general condition of the City sewerage system. In the higher elevation areas the sewers were generally in quite good condition and were extremely clean. This can be attributed to the high velocities in these steeper areas. As shown on Exhibit 12, however, numerous sewers in the lower areas were found to be heavily silted which substantially reduced their carrying capacity. The City has since purchased new sewer rodding machines and instituted an ongoing program to keep these sewers clean.

If one compares Exhibit 11 and Exhibit 12 it will be noted that many of the silted sewers coincide with flood prone areas. Silted sewers certainly have helped cause some of the flooding but are not considered to be the major cause in the majority of the locations. In fact, the same problems causing the flooding have also caused the silting of these sewers. Generally these sewers are on extremely flat grades which produce very low velocities conducive to siltation. Also, tidal backup in these low elevation flatly graded sewers causes a backwater effect which again reduces velocity and encourages settlement of suspended material.

Maintenance of these sewers will be required at frequent intervals if they are to be maintained in satisfactory condition. Hopefully, the construction of the Newark Meadows Pumping Station and improved drainage facilities will increase the overall gradients allowing higher velocities in these sewers to help alleviate the silting problem.

EXHIBIT 12

SILTED SEWERS
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLLC10541

EXHIBIT 13

BRICK SEWERS

POLLUTION ABATEMENT PLAN

CITY OF NEWARK, NEW JERSEY

KLL010542

CHAPTER III - SANITARY FLOW INVESTIGATION

POPULATION

The City of Newark was incorporated in 1836 and experienced steady growth from a population of 10,953 in 1830 to 136,508 in 1880. From 1880 to 1930, the population tripled to 442,337 which is the largest population the City has experienced. Exhibit 14 shows that since 1930 the population has ranged from the high of 442,337 to a low of 382,220 which occurred in 1970.

The decrease in population has been due to out-migration. In part, this situation was brought about by an increasing deterioration of housing facilities, especially in the core area, which markedly reduced the supply in the City. Other factors that may have contributed to out-migration were the easy and comfortable suburban living and the decrease in employment opportunities from industries which have gradually moved to the surrounding communities which have lower tax rates.

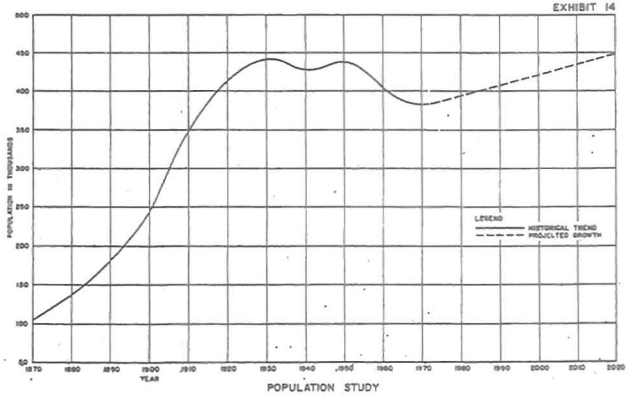
An attempt to reverse the trend has been made and the accomplishments in the urban renewal program, though modest, have begun to take effect. Since the commencement of this program, the rate of population loss in the City has been reduced, as illustrated by Exhibit 14.

To project the population to the 50 year design period, the housing program in the City has been relied upon. In 1950, total housing stock in Newark was 124,400 of which 122,530 were occupied by a population of 438,780. Since the beginning of the urban renewal program, many dilapidated buildings have been demolished, others have been rehabilitated and many new housing units have been constructed. The population count in 1960 dropped to 405,220 although the total housing units increased to 134,870 of which 127,770 were occupied. The continuation of urban renewal efforts to 1970 brought the total dwelling units to 127,424 of which 121,040 were occupied by a population of 381,930. Assessment of the rate of construction and demolition in the urban renewal sites establishes an average output of 1500 net dwelling units every decade. At this rate, it is expected that in the next 50 years, the available housing stocks in the City will reach 131,960 units. It was also estimated that the household density in the City would reach a peak of 3.41 persons per dwelling unit. At this density, the maximum population that may be expected in the City would be 449,980 in the year 2020.

Intermediate population figures between the year 1970 and 2020 have also been projected. Projections were based on the assumption that the household density in the area will increase uniformly from 3.00 to 3.41 persons per dwelling unit in 50 years.

Previously, two studies of population were made of the City. In 1968, Bruce E. Newling of the Department of Economics, City College of New York, projected a population range between 366,757 in 1970 and 303,227 in the year 2000. His projection was one of continuing decline. The Bureau of Census in 1967 in its "Current Population Report" series P25#375 made two projections, one based on series 1B (High Fertility-High Migration Pattern) and the other Series 11D (the low-low pattern). A population increase was predicted in both series for both 1970 and 1975. For 1975, in series 1B, the population projection is 443,000 and in series 11D, it is 423,000. The

EXHIBIT 14



POPULATION STUDY

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Bureau of Census Projections were 15.92 and 10.72% high when compared to the 1970 Census returns while B.E. Newlings was only 4% low.

In the 1970 census figure, a decline in the rate of population loss was noticeable. In fact, the figures seem to establish a recovery. This is attributable to the definite steps taken toward saving existing housing through rehabilitation and in constructing new units. It is believed that this population recovery will continue inasmuch as the supply of decent housing units is increasing.

The sizing of sanitary sewage facilities was based on the maximum projection curve shown on Exhibit 14. The population densities corresponding to each of the four (4) residential zones, as defined in the City Master Plan, were determined. A fairly recent photogrammetric map of the City was used to make house-to-house counts on delineated typical First and Second Residence Zones. The records of the Newark Housing Authority and the Urban Renewal Program, as well as the Census Tract of the Bureau of Census, were studied to determine the density in the Third and Fourth Residence zones. The densities established were considered a saturated condition for the given area and these are reflected for the rest of the City.

The following densities were used for designs:

First Residence	26 persons/acre
Second Residence	41 persons/acre
Third Residence	87 persons/acre
Fourth Residence	231 persons/acre

These values reflect the permanent population of the City. In addition there are over 200,000 jobs in the City which are primarily filled by commuters. These commuters also place a demand upon the facilities within the City which must be considered when determining services based on population.

DESIGN FLOWS

The water consumption records of the City for 1969 and 1970 were an additional source of information that was analyzed to determine sanitary sewage discharge rates. The results of these analyses were compared with the actual record flows in the South Side Interceptor Sewer and other gaging locations to establish the unit rates of wastewater discharge.

The water billing records of the City of Newark were divided into the categories of present zoning ordinance and future land use plan. The water use records of several water users in each category were analyzed to determine average daily flow. Generally, the consumers selected were above average in size and were considered to use more than average amounts of water. It is also generally accepted that not all water used is discharged into a sewer. To account for these two factors, the average daily water use of the consumers investigated was reduced by 15% in the case of domestic consumers and 30% in the case of industrial and commercial consumers.

Domestic Flows

The water consumption records of 14 large public apartment buildings were studied to determine the equivalent sanitary sewage contributed by the population. The public housing units analyzed included the Columbus Homes, Boyden Court, Kretchmer Housing, Walsh Homes, Crane Village and others. All of these apartments are operated and managed by the Newark Housing Authority. The study covered 38,200 people in 12,165 families (3.15± persons per dwelling unit).

The average rate of water usage in these apartments was found to be 118 gallons per capita per day (gpcd). For the purpose of investigation and design, the equivalent wastewater is taken as 85% of the above water consumption rates; hence, the average sanitary flow is established at 100 gpcd. This flow rate has been confirmed as a valid design flow by a sewer gaging program, and also corresponds to normal design criteria.

Commercial Flows

The commercial zone is divided into four land use categories. It is anticipated that the business core of the City, or fourth commercial zone, will contribute an average of 21,000 gallons per acre per day. This quantity results from an analysis of the total water consumption of 39 commercial buildings in the Central Business District. Certain commercial buildings located along Broad Street were excluded from the analysis because of their extremely high wastewater flow. These, however, were treated as slug flows in the design of the proposed sanitary sewers.

The third commercial zone, or community commercial areas, located mainly on Bergen Street, Clinton Avenue, Ferry Street, Broadway Avenue, Central

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Avenue and Springfield Avenue is expected to contribute an average of 20,000 gallons per acre per day. This quantity was determined from the analysis of the domestic water consumption rate of 13 establishments along the defined routes. The above two commercial zones have high unit contributions because of the high densities of multi-story buildings in the district.

The second commercial zone, or neighborhood commercial area, will contribute an average of 9,000 gallons per acre per day. This was determined from the study of the water usage of 18 commercial establishments in this zone.

Following the same method of analysis, it is predicted that the first commercial zone, or general commercial area, will contribute an average flow of 13,000 gallons per acre per day. The study was made on 17 general commercial establishments located in the area.

Industrial Flows

The light industrial and the general industrial areas were analyzed together. This was done because the location of one zone is interspersed with the second, such that no distinct line separates the two. In this category, 35 industries were studied and their rate of water usage, taken at 70%, indicates an average industrial wastewater contribution of 7,000 gallons per acre per day.

In the heavy industrial zone, the expected average flow contribution is 11,000 gallons per acre per day. This was based on 33 heavy industries located in Newark. Again, this figure was 70% of the total average water usage. Three heavy water users, Ballantine and Anheuser-Busch Breweries and Englehard Industries, classified under this category but located within the light and general industrial area, have been excluded from the analysis because of their extremely high contribution to the system. These flows are considered slug contributions in the design.

Institutional Flows

In the institutional zone, the water usage of 5 hospitals, 8 schools and one nursing home was evaluated. The value determined as average contribution from the institutional area is 11,000 gpd. This quantity represents 90% of the total water consumption of these establishments.

Infiltration

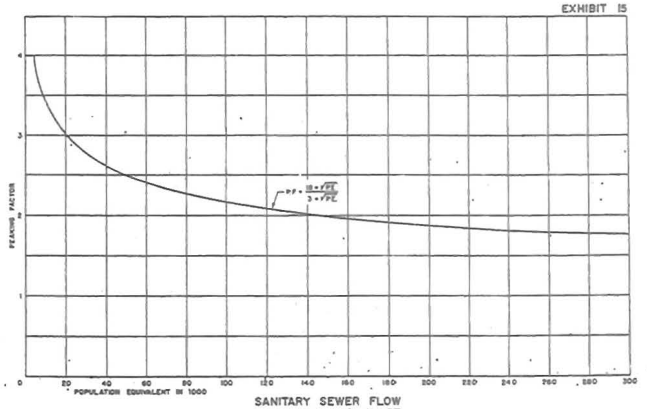
Various infiltration values are accepted by many authorities ranging between a minimum of 200 gpd/inch diameter/mile of sewer and a maximum of 60,000 gpd/inch diameter/mile of sewer. For this study, an arbitrary value of 5 gallons per capita per day is assumed which is a conservative figure corresponding to approximately 500 gpd/inch diameter/mile of sewer.

PRESENT FLOW ANALYSIS

Analysis of South Side Interceptor Sewer Meter Records

A separate sanitary sewer system is designed to prevent the entrance of storm runoff. However, the amount of groundwater seeping through leaky joints or entering the openings in manhole covers can increase the flow in a sanitary sewer substantially. Also, infrequent peaks in sanitary sewers due to daily fluctuations in use are accounted for in design calculations by using a peaking factor. The average daily dry weather flow is multiplied by this factor to establish the design capacity. Exhibit 15 shows that the peaking factor varies with the size of the watershed or tributary population. The smaller the tributary population, the greater the peaking factor. The peaking

EXHIBIT 15



SANITARY SEWER FLOW
PEAKING FACTOR CHART

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factor curve has been taken from several sources and has been substantiated by analysis of the South Side Interceptor Sewer meter records and by a gaging program conducted for this study.

The South Side Interceptor Sewer carries sewerage from the Peddie, Queens and Waverly Districts during dry weather periods. The combined sewer for each of these districts is connected to the South Side Interceptor Sewer through a regulating chamber which is equipped with a water level and flow recorder. The records of each of these chambers have been analyzed to establish the average, maximum and minimum flows. It is important to remember that each of these districts is drained by combined sewers which means that the sewers also carry storm runoff during wet weather periods. The normal range of the ratio between peak flow and average flow in sanitary sewers varies from 1½ to 1 to 4 to 1. In combined sewers, this ratio is greatly increased and the Peddie District is an excellent example with an average daily flow of 13.4 mgd and a peak flow capacity of 600 mgd.

Peddie District

The Peddie District is the largest district in this system, with an equivalent population of approximately 144,000 people. Equivalent population is a term used to equate industrial and commercial water and sewage usage to an equivalent amount of domestic use. The drainage district consists of approximately 1,880 acres and has an average daily flow of 13.4 mgd. Land use in the Peddie District is primarily residential and commercial with 845 acres and 640 acres, respectively. This district contains a substantial portion of the highlands and is one of the older areas of the City. The typical residential area consists of three to six family dwellings on narrow lots with a few new residential housing projects. The majority of the commercial use is typically the storefront with residential dwellings above. Much of the housing in this district is in ill repair and will probably be replaced by urban renewal in the near future. There are no major industrial water users in the district and, therefore, this district provides a fairly realistic measure of per capita sewage discharge.

The average daily flow from the district is 93 gallons per capita per day, and the recorded dry weather peak flow is 34 mgd which is 2.6 times the average daily flow. The average flow during the maximum week of a given year is 1.4 times the average yearly flow. The peaking factor derived from Exhibit 15 is 2.0, but the key here is to recall that Peddie District is drained by combined sewers. This peak dry weather flow could occur from flushing a fire hydrant, pumping out an excavation or some similar type of activity which results in excess water entering combined sewers which is not normally found in a sanitary sewage system.

Waverly District

The Waverly District lies along the Southern boundary of Newark. It contains approximately 350 acres, 50 acres of which are within the City of Elizabeth. This district is primarily industrial with 200 acres being used for that purpose and only 58 acres for residential uses (containing an estimated population of 5,000 people). Several major industries are also located in this district. Anheuser Busch is the largest, using approximately 4.0 mgd and discharging 3.0 mgd of this into the sewers. Because of this intense industrial use, the equivalent population of this watershed is 100,000 people, even though the actual population is approximately 5,000.

The recorded dry weather peak in this combined sewage system is 2.5 times the average daily flow of 9.5 million gallons a day. The ratio of the average flow during a maximum week to the yearly average is 1.6. Based on an equivalent population of 100,000 people, the peaking factor in a normal sanitary sewage system would be 2.2, which lies between the 2.5 and 1.6 recorded in this combined sewage system. Because of the very heavy industrial uses, it is difficult to evaluate domestic or per capita residential flows in the district. The range of peaking factors, however, is significant.

Queen District

The Queen District is a mixed use combined sewer district draining approximately 335 acres. Sixty-seven acres are residential and 165 acres are industrial. The residential land use in this district is primarily 1-family homes with approximately six high-rise apartment buildings making up the remaining area. The industrial area can be defined as generally being light industry with light to moderate water use. The estimated population of the district is 33,000 people. However, when industrial and commercial uses are considered, the equivalent population is estimated to be 40,000 people. The recorded peak dry weather flow from the district is 20 mgd which is five times as great as the average daily flow. The ratio of the average flow during the maximum week to the yearly average is 2.1 to 1. Based on the peaking factor curve in Exhibit 15, a factor of 2.7 would be anticipated for the equivalent population of a normal sanitary sewer system. There are

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several factors in this watershed which would tend to increase the apparent dry weather flow. Weequahic Lake drains into this combined sewer system and the lake occasionally discharges into the combined sewer system even during non-storm periods. In addition, there has been a great deal of construction on Route 78 in this district and frequent pumping of excavations into the combined sewer system has occurred. Both of these sources would contribute a substantial amount of water to the combined sewer system and could not be detected by reviewing the rainfall records for this area.

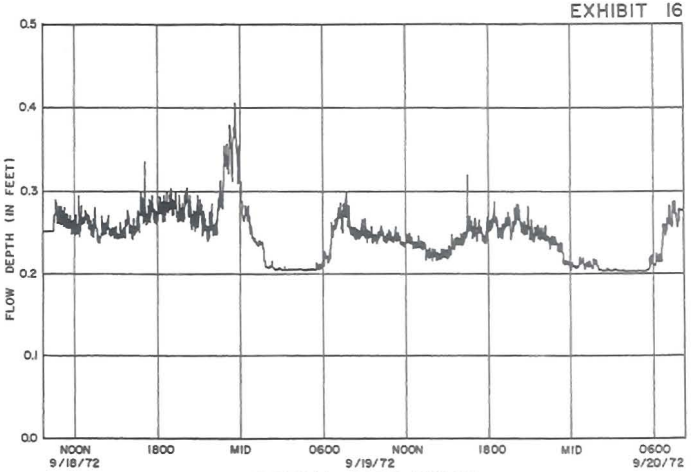
The analysis of the flow records at the South Side Interceptor Diversion Chambers has provided a general confirmation of the flows derived from the water use records. Water use records were applied on a per acre basis for the land use within each of these watersheds and then totalled at the outfall. This total, which was an average daily figure, was then compared to the average daily discharges for each of these regulators. The flows on a per acre basis were then readjusted and this procedure was followed several times until the approximated or estimated flows on a per acre basis had a good correlation with each of the recorded flows.

SEWER GAGING PROGRAM

A sewer gaging program was undertaken to verify the average daily and peak sanitary sewage flows and the storm weather flows in the sewerage system of the City of Newark. A general discussion of the procedures that were followed and a basic analysis of the sanitary sewage flows will follow. The results of a wet weather analysis will be discussed later in this report.

Leopold Stevens Water Level Recorders were adapted for installation at selected manholes throughout the system. Scow floats were utilized to measure the water level. The water level recorders provide a continuous chart record of the depth of flow and were operated by a wind clock mechanism. Various scales are available to determine the water surface fluctuation within any reasonable desired accuracy. The time scale on the charts was such that two days of recording was obtained on each 9½ inch wide chart. The vertical scale for depth was varied depending upon the size of the system to be gaged. In the smaller sewers, 15 inches and below, a scale of 1/1 was utilized, thus a six inch fluctuation on the chart would represent a 6 inch water level fluctuation in the sewer. In larger installations a 2 to 1 gearing was used, and in the diversion chambers and on extremely large sewers a 10 to 1 scale was utilized. Exhibit 16, Gage Chart, shows a typical chart from one of the sewer installations.

EXHIBIT 16



TYPICAL GAGE CHART

There were several factors which had to be considered in selecting manholes where flows would be recorded:

1. The sewers had to be clean so that the water level could seek its "Normal Depth".

2. Sewers were selected which had a medium slope and free discharge at the outlet end into a larger sewer. This was to eliminate the possibility of a backwater condition which would produce higher than "Normal Depth" water levels. Excessive slopes produce extremely high velocities and supercritical flow which would also decrease the accuracy of the meter.

3. Straight through manholes had to be selected to eliminate the effect of superelevation of the water as it rounded a bend. For the same reason, manholes had to be selected that did not have a "T" or lateral branch sewer coming in from the side.

4. Uniform slope of the sewer for at least one manhole reach downstream and upstream of the manhole to be gaged was essential to provide a constant water surface and to allow calculation of the "Normal Depth" capacity.

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5. The topography of the area tributary to the manhole and a knowledge of tributary populations was essential so that the recorded flow could be correlated to a per capita and a per acre discharge.

6. The manhole location and the street traffic also had an influence on the selection in that it was essential to have reasonable access to the manhole to install the equipment and to make periodic visits to change the charts and maintain the equipment.

In analyzing the sewer system for the City of Newark, it was very difficult to find locations which met all of these criteria. With over 500 miles of sewers in the City of Newark, it would seem that there would be numerous ideal gaging locations, but this did not turn out to be the case. The locations which were finally selected conformed most closely to the aforementioned conditions.

Additional field work was required to develop an accurate means of relating the depth of flow in the sewers to the rate of discharge. A field survey was conducted to accurately determine the slope of the sewer through the upstream and downstream manhole reach for each gaging location. The depth of flow at a particular time was measured, and the time of travel between manholes was measured by using a flourescent dye. Utilizing the depth of flow, the area of flow and the wetted perimeter were calculated. Then, with the slopes as determined by field survey, the gaged velocity of flow, the area and the wetted perimeter, Manning's equation was used to calculate Manning's coefficient of friction "N" for each particular sewer. This coefficient of friction was then assumed to be constant over the entire range of flows which were gaged. The coefficient of friction was determined during average dry weather flow conditions and therefore provided the best correlation for those flows. With that information established, flow rate versus depth of flow curves were developed for each of these sewer installations. Thus, the recorded depth of flow could be converted directly to flow using the curves.

Wharton Street Gaging

A water level recorder was installed in Wharton Street, 280 feet west of Frelinghuysen Avenue. This location falls within the Waverly District and the meter was located such that a major portion of the residential area was tributary to the gage. The depth of flow was recorded in a 33" diameter combined sewer at a slope of 0.8 percent using a water level recorder with a 2 to 1 chart ratio. During dry flow periods this concrete pipe was determined to have a Manning coefficient of friction of 0.0175.

The 37.94 acres tributary to the gage included 22.75 acres residential; 7.56 acres industrial; and 7.63 acres park. The major development in this watershed is the multiple family housing project known as N.J. 2-10, which consists of 730 dwelling units. There are also several high rise apartment buildings containing 656 units which when combined with the 87 dwelling units contained in one to three family residences brings the total dwelling unit count to 1,493. It was assumed that this area would have a residential density of 3.1 persons per unit which resulted in an estimated population of 4,630 persons.

The water level recorder was operated at this location from October 10 through October 30, 1972. During this period the average flow was determined to be 0.27 mgd and a peak dry weather flow of 0.41 mgd was recorded. A check of the industries in this area determined that they made no substantial contribution to dry weather flow. On several occasions a low flow of .09 mgd was recorded during early morning hours, which is to be anticipated. The average daily flow of .27 mgd when divided by the population, results in an average per capita flow of 58 gallons per capita per day. Although this flow is substantially lower than that experienced in many residential areas, it had been predicted by the City's water use records and has been experienced in many other densely populated multi-family unit areas thoughout the country. Somewhat of a surprise, however, is the peaking factor of only 1.5 when the curve on Exhibit 15 indicates that it should be on the order of 4. There are two explanations for this occurrence; the first is that the gaging only covered a three week period. A higher peak dry weather flow might easily occur during a more extended gaging period. Second, the 33" combined sewer which was gaged provides a great deal of storage capacity which reduces the peak as it travels downstream from the housing units to the meter. A 12" diameter sanitary sewer which is more normal for an area such as this, would provide much less storage capacity and the peak would travel downstream with much less distortion. Exhibit 15 also allows for normal amounts of infiltration during both wet and dry weather, and being a "design curve" should be conservatively high.

Mt. Prospect Street Gaging

A water level recorder was installed on Mt. Prospect Street approximately 180 feet north of Abington Avenue. The sewer in this street is a 20" by 30"

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egg shaped brick sewer, laid at a slope of 0.5%, which served as a combined sewer until the recent installation of a 36" storm drain on the opposite side of Mt. Prospect Street. The land use in this area is entirely residential with a total tributary area of 15.60 acres. There are, however, three different residential land uses on this small tract. 4.36 acres of high rise, R-4 use; 2.98 acres of medium density residential, R-3 use; and 8.26 acres of detached single family housing, R-1 use. A dwelling unit count on this area has identified 291 multiple family units and 51 single family units, which result in an approximate population of 1,120.

The water level recorder was operated at this location from September 8, 1972 to September 18, 1972. During that period the average flow was approximately 0.11 mgd and on several occasions a low flow of 0.07 mgd was recorded. The largest flow recorded was 0.29 mgd, which is approximately 2.7 times greater than the average. This peaking factor ratio is less than would be predicted by Exhibit 15, which again demonstrates the validity of Exhibit 15 for design purposes. The recorded low flow of 0.07 mgd is probably not the absolute minimum. At this low flow, the accuracy of the metering is decreased and it is quite probable that the true low flow is somewhat less than this value. The average per capita discharge of this district is 98 gallons per capita per day which provides a very good correlation for the design values used in this report.

South 8th Street Gaging

A water level recorder was installed on South 8th Street approximately 200 feet south of Central Avenue. The gage was installed in a 15" diameter tile sewer and was operated from September 22 through October 9, 1972. During the gaging period, a relatively large amount of debris built up in the manholes immediately upstream and immediately downstream of the gaging location. This build-up of debris did have some influence upon the accuracy of the gaging and resulted in a very high Manning's coefficient of friction through the entire reach. It was estimated by field investigation that the Manning's coefficient was on the order of .028 while a value of .013 is the normal design value used for tile sewers.

The entire 13.23 acres tributary to the gage is an R-3 residential zone. A housing unit survey in this area indicated that there are 301 units, and utilizing a density of 3.4 persons per unit, the tributary population has been estimated to be 1,020 persons. The dwellings consist generally of from 2 to 6 family three-story structures. In addition to this residential development, there is also a grammar school tributary to this gaging location. This grammar school did influence the recorded flows in the sewers and there was a consistent increase at approximately 10:00 AM, or recess time, on weekdays. The recorded average daily flow in this area was .41 mgd and on several occasions a low flow of approximately .35 mgd occurred. This low flow is extremely high and it suggests either a great amount of infiltration into this sewer or that the water level records were influenced by the debris that built up in the system. The recorded peak dry weather flow in this combined sewer was .55 mgd.

To demonstrate that the recorded low flow is excessive, there would be approximately 380 gallons per capita per day based on the 0.34 mgd low flow recorded. By comparing the 380 gallons per capita per day with the recorded flows in other residential areas, it will become obvious that either there is a substantial amount of infiltration or the water level was increased by the built up debris in this system. In either case, this was compensated for by subtracting the low flow value of .34 mgd from both the recorded average daily flow and the recorded dry weather peak flow. This resulted in a corrected average daily flow of .065 mgd and a corrected peak dry weather flow of .209 mgd. This average daily flow divided by a population of 1,020 persons resulted in an average per capita discharge of 64 gpd. This is much more in line with the values obtained at the other gaging locations. The peaking ratio is also quite reasonable for this district after this adjustment is made in that it would result in a factor of 3.2. With a school in this system, it would be anticipated that the peak flow ratio would be higher for this district than in the other districts gaged.

Summary — Gaging Program

The metering of the sanitary sewage flows at these locations has provided a basic verification of the design per capita flows and the peaking factor curve. A design residential flow of 100 gallons per capita has been utilized in this report. Records of Mt. Prospect Street indicate that the average flow in that area is 98 gallons per capita. While the other gaging stations did indicate a lower per capita flow, it is desirable to have a design flow equal to or exceeding all flows that can reasonably be expected. The peaking factors which were experienced at these gaging locations were also less than the 4.0 ratio indicated on Exhibit 15. The short term gaging records would have a low probability of recording the true peak flow for each of these systems. In addition, it is again desirable to utilize a peaking factor which is in excess of the actual peak flows that are to be anticipated. A conservative approach

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to design allows for future increases in infiltration which may occur due to future deterioration of the sewers. In summary, it is considered that this gaging program provided a good check of the design flows utilized for sizing sanitary sewage facilities in this report.

The recorded wastewater flow to the South Side Interceptor Sewer is shown in Table III-1. Average daily flows are summarized in Table III-2, and a correlation of theoretical peaking factors obtained from Exhibit 15 with peaking factors developed from actual flow records is shown in Table III-3.

TABLE III-1

WASTEWATER FLOW RECORD TO SOUTH SIDE INTERCEPTOR
(Source: Bureau of Sewers, City of Newark, N. J.)

	PEDDIE OUTLET*				QUEEN OUTLET*				WAVERLY OUTLET*			
Year	Days of Record	Peak M.G.D.	Average M.G.D.	Low M.G.D.	Days of Record	Peak M.G.D.	Average M.G.D.	Low M.G.D.	Days of Record	Peak M.G.D.	Average M.G.D.	Low M.G.D.
1967	336	15.48	13.09	7.18	273	4.58	1.51	.16	336	10.93	8.68	4.5
1968	175 (a)	15.08	14.21	11.31	364	7.18	3.28	.79	350	13.93	9.90	3.26
1969	147 (b)	14.33	10.99	8.01	147 (c)	6.77	3.81	2.34	154 (c)	14.78	8.25	3.51
1970	315	19.02	13.79	12.47	357	7.81	4.36	1.88	357	12.18	10.26	5.04
1971	182 (d)	18.05	14.93	13.61	182 (d)	8.26	4.44	.87	187 (d)	10.38	9.37	7.54

* *Dry weather discharges of 3 basins are accepted to the South Side Interceptor thru 3 separate metering chambers each provided with float controlled regulators. Wet weather flows are diverted to the ditches and metering devices do not record flow under this condition.*

Peak Flow (M.G.D.) is the daily average during the maximum week.

Low Flow (M.G.D.) is the daily average during the minimum week.

(a) Recorded during January; and August to December.

(b) Recorded from January to March; and November and December.

(c) Recorded from January to April and November and December.

(d) Recorded from January to July.

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TABLE III-2

AVERAGE DAILY FLOW

	Average Daily Flow MGD	Resident Population	Per Capita Discharge	Equivalent Population	Equivalent Per Capita Discharge
Peddie District	13.4	86,000	155.	144,0	93
Waverly District	9.5	7,000	1360.	100,000	95
Queen District	4.0	33,000	121.	40,000	100
Wharton St. Gage	0.27	4,630	58.	4,630	58
Mt. Propspect St. Gage	0.11	1,120	98	1,120	98
South 8th St. Gage	0.65	1,020	64.	1,020	64

TABLE III-3

SANITARY SEWER PEAKING FACTOR CORRELATION

Location	Dry Weather Equivalent Population	Ratio Recorded Flow Maximum Peak To Yearly Ave.	Ratio Average Peaking Factor Week To Yearly Ave.	From Design Curve
Peddie Outfall*	144,000	2.6	1.4	2.0
Waverly Outfall*	100,000	2.5	1.6	2.2
Queen Outfall*	34,000	5.0	2.0	2.7
Wharton St.**	4,628	1.5	-—-	4.0
Mt. Prospect St.**	1,119	2.7	-—-	4.0
So. 8th St.**	1,023	3.2	-—-	4.0

* Analysis of flow records from City operated diversion chamber gages.

**Water level recorders installed by James P. Purcell Associates for a period of two to four weeks.

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CHAPTER IV — HYDROLOGIC INVESTIGATION

The most widely used method of computing storm water runoff is the Rational Method, which was first introduced in 1889 as an improvement to the empirical formulas in use at the time. The Rational Formula Q = CIA yields the peak flow, Q, based on several assumptions made by the engineer. The overall runoff coefficient C is established by multiplying each type of land use by an assumed runoff coefficient and taking the weighted average. The watershed area, A, is computed in acres. The duration of the design rainfall is generally based on the assumption that the peak runoff will occur at the first instant that the entire upstream watershed is contributing flow to the location being designed. The time required for the entire watershed to contribute flow is known as the time of concentration. This is the time required for a drop of water falling at the most remote point of the watershed to flow downstream to the location being designed. The frequency of the rainfall is selected on the basis of the flood protection that is desired. A 5 year design frequency is generally recommended for smaller watersheds such as the general collection systems in Newark. Once the frequency and duration have been determined, the average rainall intensity I, is selected from a rainfall intensity-duration frequency curve.

Newark, New Jersey receives approximately 41.0 inches of precipitation annually. A weather station has been operated at Newark Airport by the U.S. Department of Commerce National Weather Service since 1931, from which complete records are available.

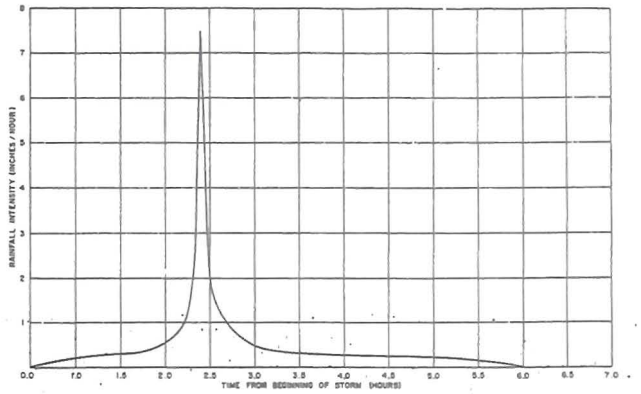
The rainfall intensity for this general area has been studied in great detail by the National Weather Service, resulting in a series of Technical Papers on rainfall data published in conjunction with the Soil Conservation Service of the U.S Department of Agriculture. The rainfall intensity-duration.frequency curves most commonly used in the State of New Jersey are those published in Technical Paper No. 25. The curves used in developing the recommended design presented herein were extracted from Technical Paper 25, and represent rainfall data collected at the Sandy Hook, New Jersey weather station over a 25 year period.

The Hydrograph Method of Analysis was used to verify the results of the Rational Method. Three major characteristics of the Newark storms had to be determined for this alternate analysis. They were:

1. The rainfall intensity.
2. The storm duration.
3. The time during the storm when the peak rainfall intensity would occur.

The rainfall hyetograph shown on Exhibit 17 was developed from data published in Technical Paper No. 40 by the National Weather Service. This 2 year frequency hyetograph was then used as the basis for the Newark Drainage Model analysis described in detail in Chapter V.

EXHIBIT 17



2 YEAR FREQUENCY RAINFALL HYETOGRAPH

The hydrologic abstractions attendant to the development of a Hydrograph Method of Analysis were discussed in detail in the Interim Report. Although no longer directly pertinent to the specific recommendations of this study, this material does have value as a foundation for the analysis used to verify the recommended plan, and it has therefore been appended to this chapter.

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NEWARK LAND COVERAGE AND DRAINAGE PATTERN

The City of Newark, New Jersey is one of the most densely populated cities in the United States. An estimated population of 389,000 citizens reside in the 24.5 square miles of the City. As previously noted, the land use within the City is controlled by a zoning ordinance which defines four intensities of residential, four intensities of commercial and three intensities of industrial land use. Each of the less intense developments is generally permitted in the more intense zones. Thus, in an R-4 zone, there may be a two-family house next to a 15 story apartment house. It is also possible that the two-family house will be razed next week and another 15 story apartment house constructed. For this reason, the design of drainage facilities has been based on the maximum density of development permitted in each zone under the City Master Plan. In addition to the eleven land uses mentioned above, there is a relatively large area of cemeteries and parks, and a large airport. Typical land coverages for each zone have been derived. Exhibits 18 and 19 show existing typical land coverages for several land use zones within the City.

Several sample areas of each land use were analyzed to determine the percent of the area covered with roof tops and other impervious surfaces and the percentage covered with pervious surfaces. The results of the investigation indicated that some of the 13 land uses (eleven by zoning, plus cemeteries and parks) have practically identical land coverages, lot size and layout. Thus, from a drainage standpoint they can be combined and considered as a single type of development. The following table presents the land coverage for each of the intensities of land development.

Exhibit 20 is an illustration of the drainage pattern of a typical residential, commercial or light industrial area of the City where the topography is flat. The Ironbound area of the Adams District shown on Exhibit 53 exemplifies this pattern. There is a slight slope from the rear property line toward the curb and the streets are graded such that the gutters flow into the inlets from two directions.

In the steeper areas the block sizes are similar with the long dimension generally going across the face of the hill and the short side going downhill. The slope of the streets in the steeper areas is generally greater than one percent which results in the gutters flowing into the inlets from only one direction. In addition, the cross slope creates a condition where the gutter on the uphill side of the street drains an area extending nearly up to the uphill street and the downhill gutter drains little more than one half of the street area.

TABLE IV-1

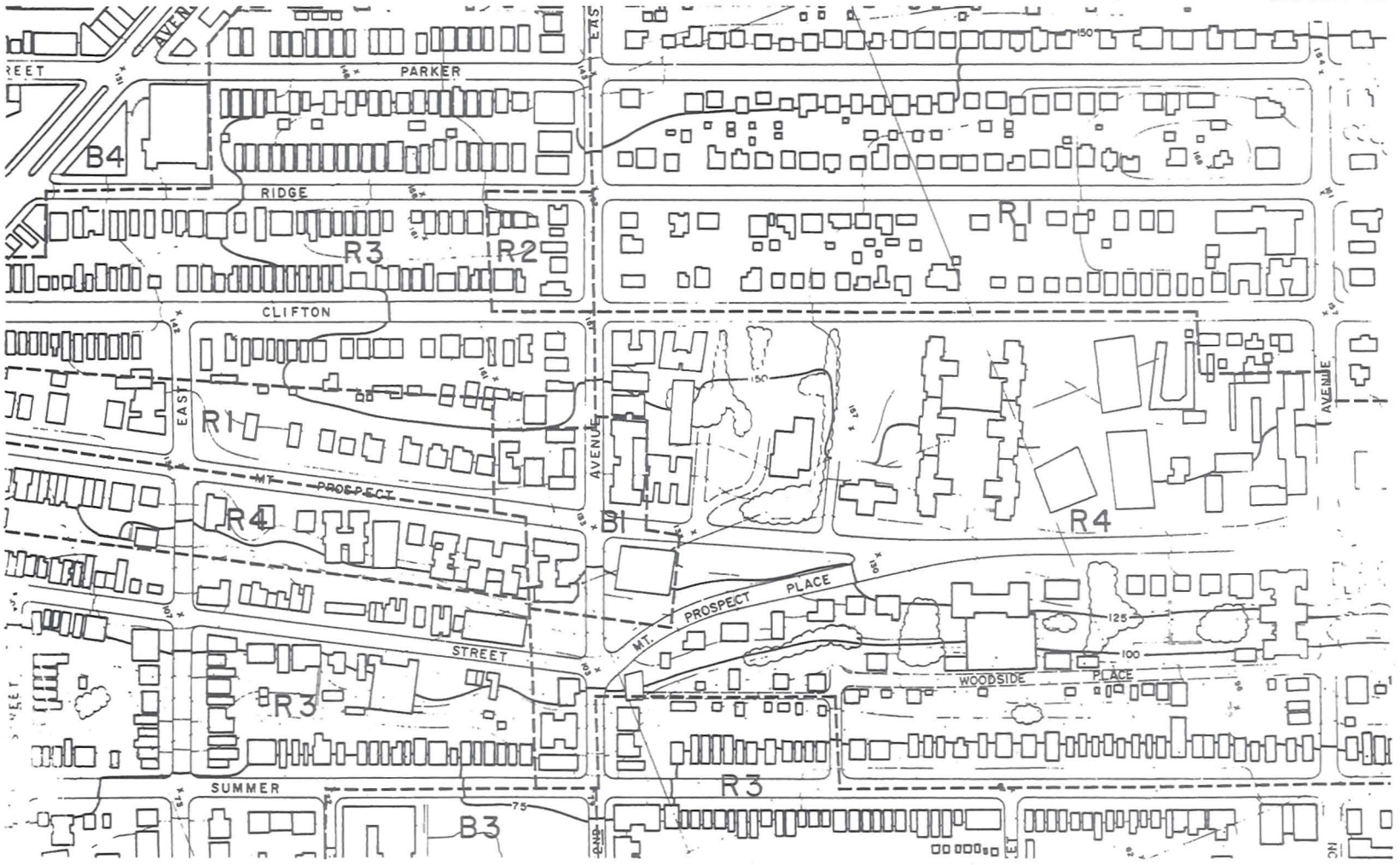
NEWARK LAND COVERAGE

Zoning Ordinance Land Use	NDM Code Number*	%Impervious Overland Flow to Gutter	% Impervious Directly Connected to Sewer
Residential 1	1	0.50	0.000
Residential 2	2	0.50	0.10
Residential 3	3	0.45	0.20
Residential 4	4	0.40	0.30
Commercial 1	4	0.40	0.30
Commercial 2	4	0.40	0.30
Commercial 3	5	0.40	0.50
Commercial 4	5	0.40	0.50
Industrial 1	6	0.40	0.40
Industrial 2	6	0.40	0.40
Industrial 3	6	0.20	0.40
Park	7	0.20	0.0
Cemetery	7	0.20	0.0

*Land uses code number for Newark Drainage Model Computer Program to be described in Chapter V.

KLLC10553

EXHIBIT 18



TYPICAL MIXED LAND USE

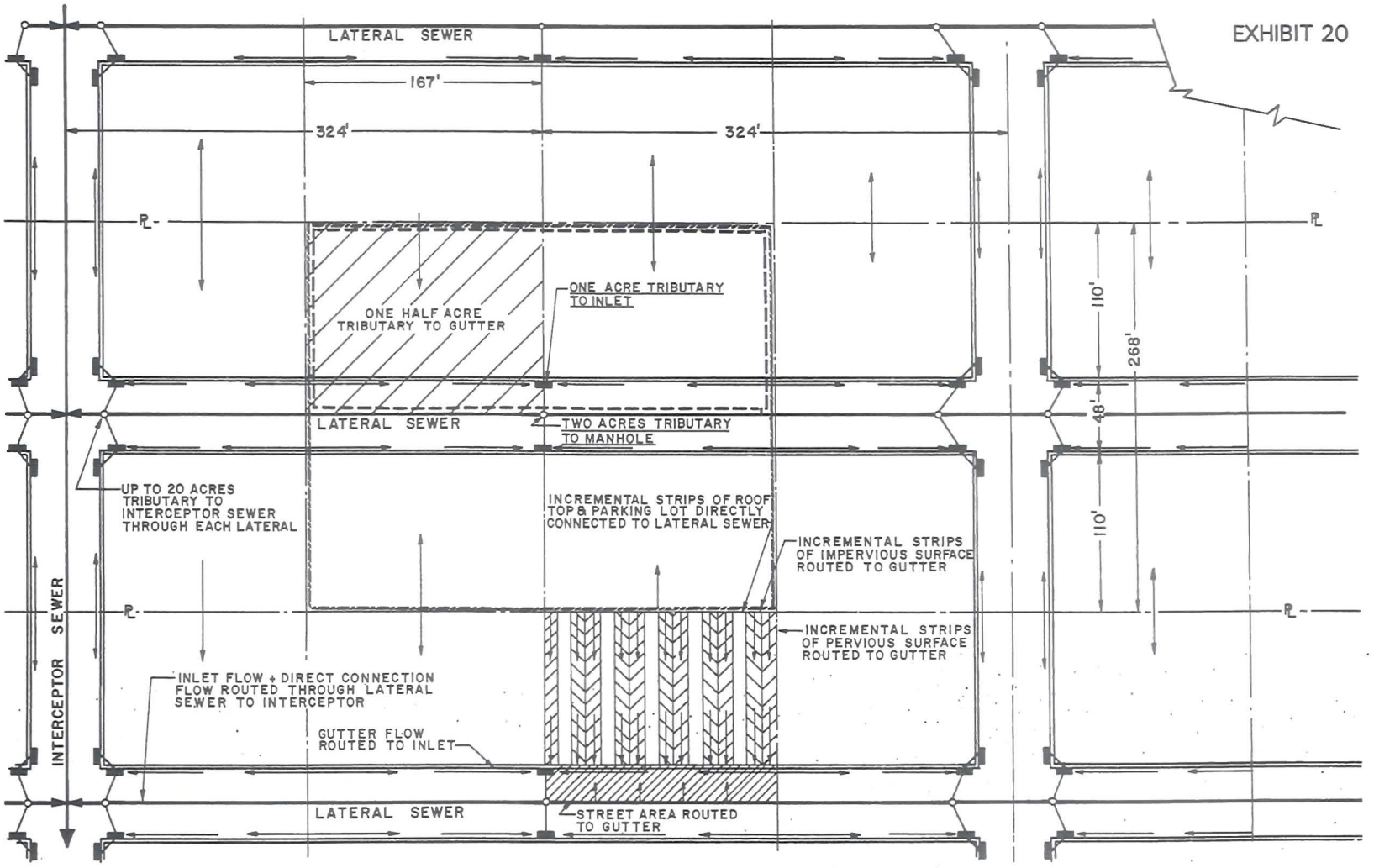
KLL010554

EXHIBIT 19

TYPICAL INTENSE LAND USE

KLL010555

EXHIBIT 20



TYPICAL DRAINAGE PATTERN

KLL010556

An investigation was conducted to evaluate the effect of the cross slope on the unit area hydrographs. It was assumed that the overland flow distance on the uphill side and downhill side were 200 feet and 20 feet respectively. These two hydrographs were added together and compared to the results obtained by using an average overland flow length of 110 feet.

During the early part of the storm the results were identical, with a maximum one percent differential 15 minutes prior to the peak. The use of the average flow length resulted in a peak flow 5 percent greater than was obtained by adding the two hydrographs. However, the average flow length runoff decreased more rapidly, and a difference of less than 1 percent was computed 40 minutes after the peak occurred. These unit area hydrographs were computed for a typical area at the upper end of a lateral sewer, which is the location at which the difference will be most pronounced. As the flows are routed downstream, high and low values will average out and nearly identical results will be obtained.

Substantial computer time and computational time can be saved by using an average overland flow distance. Since the results of the analysis show quite close agreement, the average flow length has been used.

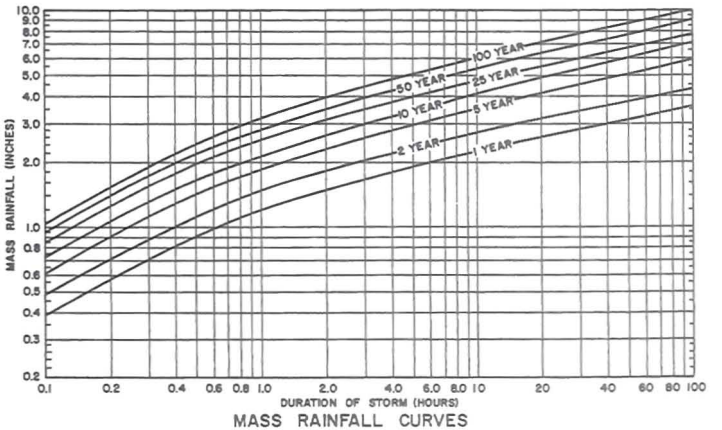
The large industrial, commercial and residential tracts within the City have been assumed to have their own internal storm drainage facilities. The layout of this internal system has been assumed to be similar to that of the rectangular lateral sewer grid laid out for the remainder of the City. This should provide conservatively high results as the internal systems are generally felt to be of a lesser capacity.

INTERIM REPORT HYDROLOGY

The mass rainfall curves shown on Exhibit 21 were developed from rainfall data extracted from Technical Paper No. 40, published by the National Weather Service. This data was also used to develop the frequency duration curve shown on Exhibit 22.

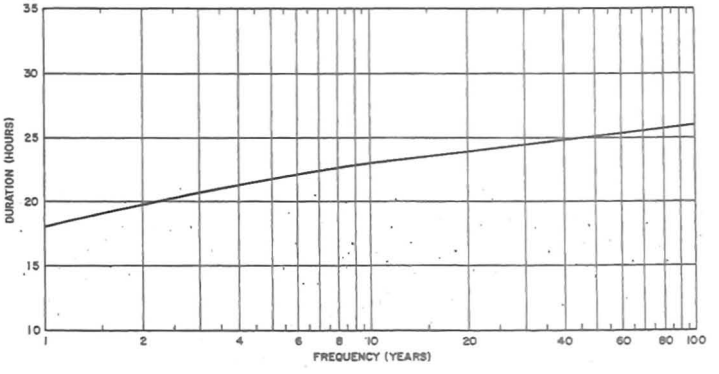
From this curve it can be seen that a 50 year frequency storm will last an average time of 25 hours. Exhibit 23 presents the time to peak ratios. The peak intensity of the 50 year frequency storm will occur at Tp/T=0.62, where Tp equals time to peak and T equals the duration of the storm.

EXHIBIT 21



MASS RAINFALL CURVES

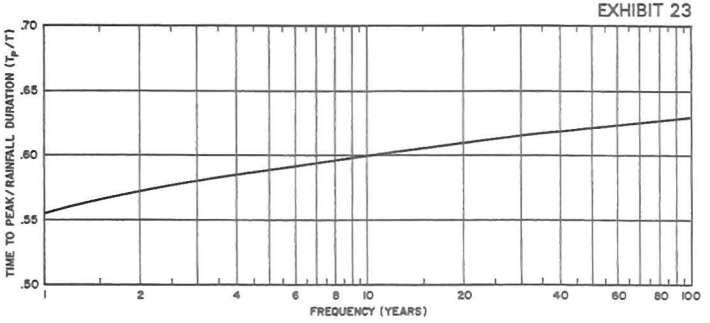
EXHIBIT 22



PROJECT RAINFALL
FREQUENCY DURATION CURVE

KLL010557

EXHIBIT 23



PROJECT RAINFALL
TIME TO PEAK RATIOS

The following procedure was used to determine these characteristics. The mass rainfall curve for each storm was broken down into incremental units of time and corresponding rainfall volume. These units were then reordered with the most intense time periods being placed closest to the storm's peak intensity as defined in Table IV-2. Each of these time units was then multiplied by the time to peak factor. The portion of the time unit corresponding to Tp/T was placed prior to the peak of the storm and the portion corresponding to 1-(Tp/T) was placed after the peak of the storm. The result was a stepped skewed pyramid which was simplified by fitting a curve to the series of points. The resulting rainfall hyetographs are presented on Exhibits 24 through 27. Exhibit 28 presents the mass curves for each storm. They have been plotted with the end of the storm at the right edge of the graph, in order to show the general relationship between each of the storms.

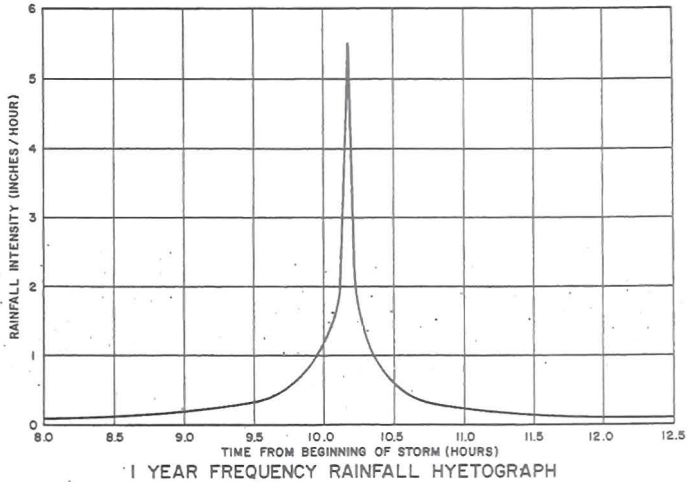
The overall duration of these storms greatly exceeds those normally considered. The tropical storms which come up the east coast deliver the greatest mass rainfalls to the Newark area. Thunderstorms with their much shorter durations have substantially smaller total volumes. A general characteristic of a hurricane is that the rainfall will last approximately 24 hours, with peak intensity occurring slightly after the midpoint of the storm. The following table presents the general characteristics of four tropical storms of different frequencies.

TABLE IV-2

CHARACTERISTICS OF TROPICAL STORMS

Storm Frequency (Years)	Duration (Hours)	Tp/T Ratio	Mass Rainfall (Inches)
1	18.0	0.555	2.54
5	21.5	0.587	4.27
10	23.5	0.600	5.08
50	25.0	0.620	6.91

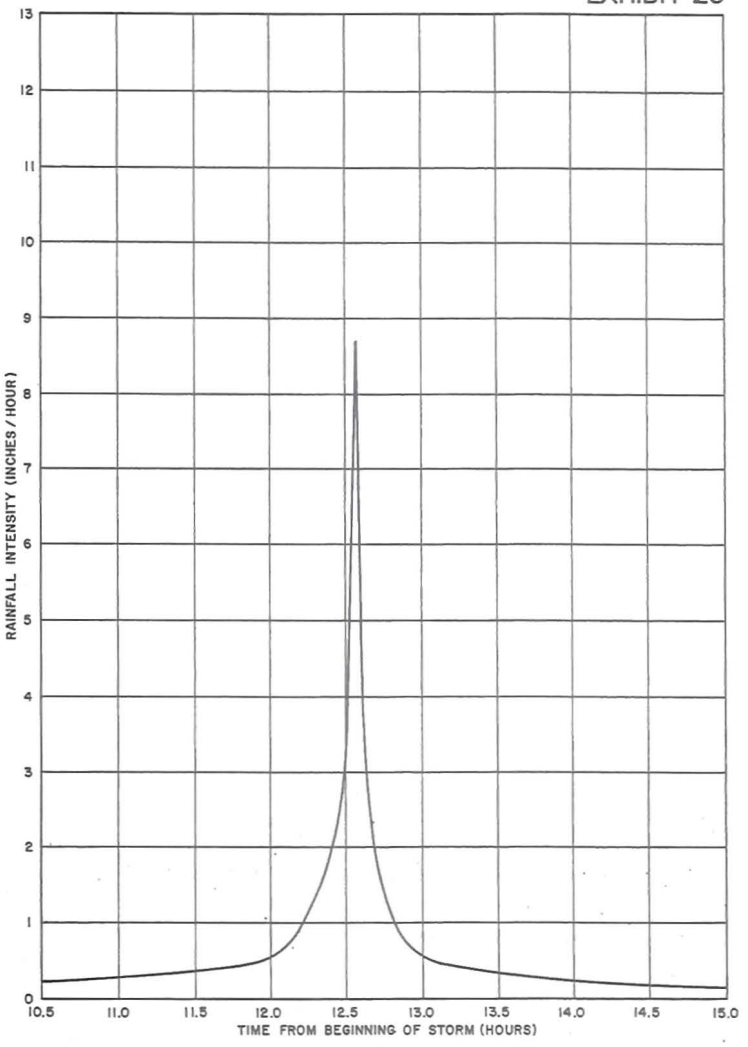
EXHIBIT 24



1 YEAR FREQUENCY RAINFALL HYETOGRAPH

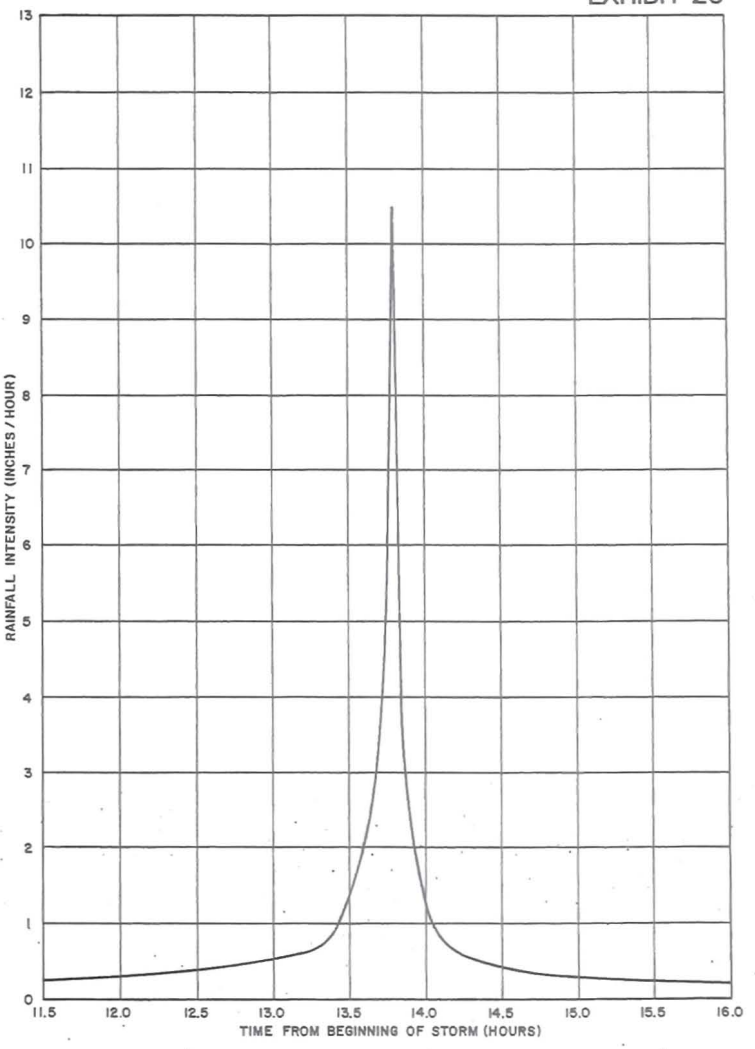
KLL010558

EXHIBIT 25



5 YEAR FREQUENCY
RAINFALL HYETOGRAPH

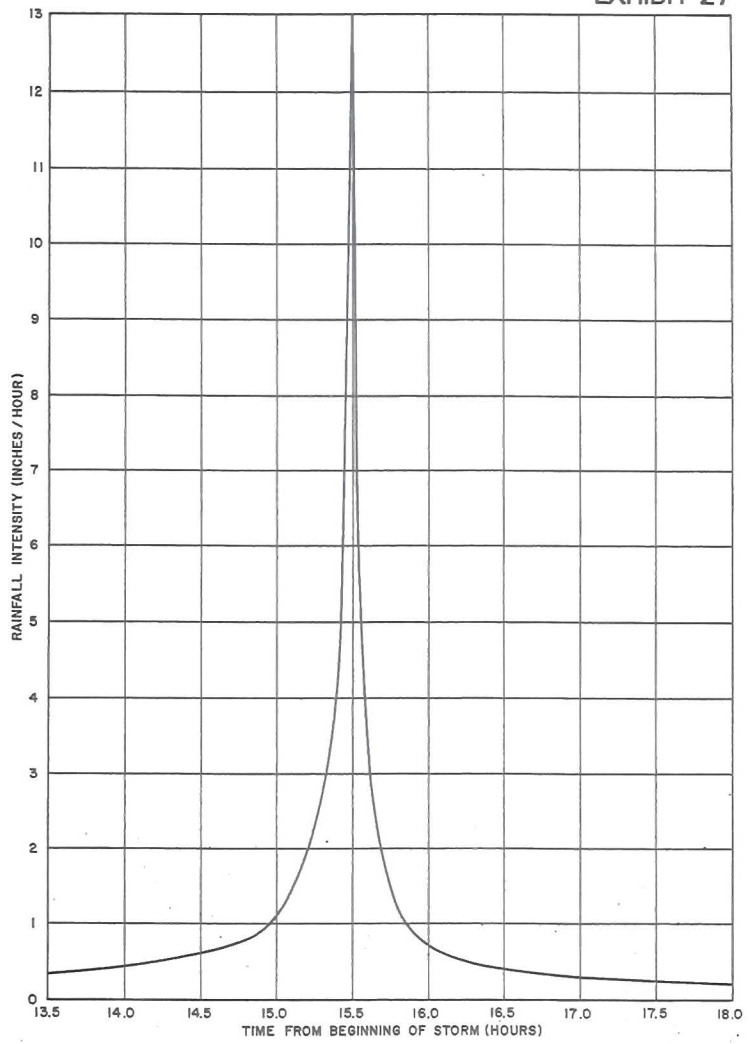
EXHIBIT 26



10 YEAR FREQUENCY
RAINFALL HYETOGRAPH

KLL010559

EXHIBIT 27



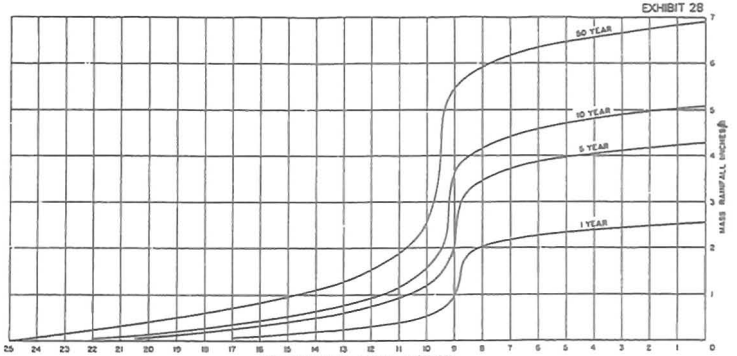
50 YEAR FREQUENCY
RAINFALL HYETOGRAPH

The basis for this analysis was the total volume of rainfall during a given storm. Tropical storms with their longer durations and greater total mass dominate the analysis. This analysis is valid for large watersheds such as the Passaic River, where the long duration storms will generally control conditions. Exhibit 29 entitled "Intense Storms" illustrates that the two tropical storms which hit the New Jersey area in 1971 had these characteristics. The durations were relatively long and the total volume was large. On that same exhibit are shown two extreme thunderstorms. However, because of their shorter duration and lesser total rainfall mass, they have a relatively minor effect upon the characteristics generated in Table IV-2. On this basis, Table IV-2 represents primarily the characteristics of a tropical storm.

An analysis of the tropical storms which have occurred in the last 20 years indicates that their maximum intensity over a short duration (less than one hour) is much less than the peak intensities which occur during a thunderstorm. Thunderstorms being generally of short duration represent the control or design condition for relatively small watersheds. Our analysis indicates that thunderstorms seldom last more than six to eight hours and that the most intense period generally lasts about three hours. Tholin and Keifer in their article "The Hydrology of Urban Runoff" noted that the peak intensity of the majority of the thunderstorms they studied had occurred at about the 3/8 point of the storm. Our analysis of thunderstorms in the Newark area shows that the peak generally occurs slightly later than this, occurring approximately at the 4/10 point for storms of a one to two year frequency and at approximately the mid-point for storms of a 25 year frequency.

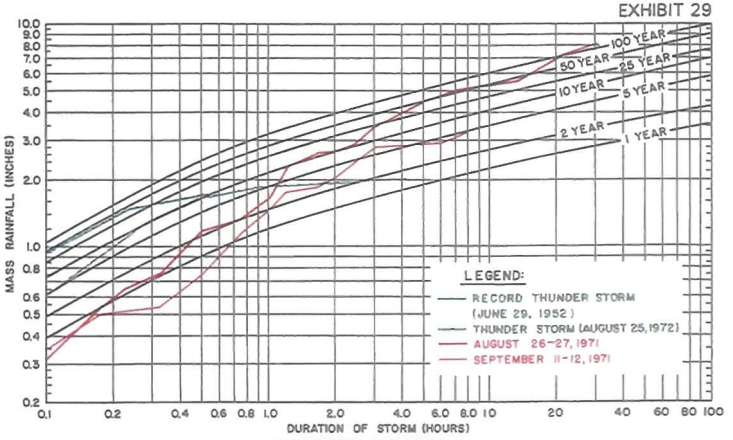
KLL010560

EXHIBIT 28



PROJECT RAINFALL
MASS CURVES

EXHIBIT 29



INTENSE STORMS

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CHAPTER V — NEWARK DRAINAGE MODEL (NDM)

The Rational Method is widely used because of its simplicity. The results for relatively small watersheds are generally felt to be of sufficient accuracy when the several assumptions left to the engineer are properly made. However, in recent years, an ever increasing number of engineers have become dissatisfied with the Rational Formula. The most frequent complaints are concerned with the following characteristics of the method:

1. The Runoff Coefficient, C., does not accurately describe the relationship between rainfall and runoff for varying land use, varying topography, and varying antecedent rainfall.

2. The peak design flow might not be accurately defined by a rainfall intensity which is based on the maximum time of concentration of the watershed.

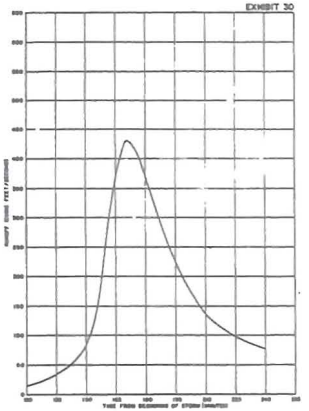
In addition, the Rational Method is difficult to apply to large complex drainage basins, and it yields only the peak flow with no measure of the volume of runoff.

Although the Rational Method is the accepted basis for design in New Jersey, because of the complexity of the Newark Basin it was decided to develop an alternate method of analysis to verify the results obtained from the Rational Method.

The most commonly used alternative to the Rational Method is the Hydrograph Method. A hydrograph is a plot or tabulation of storm runoff versus time. It presents the continuous relationship between rainfall intensity, rainfall volume, and time. Exhibit 30 is a hydrograph for the Queen Outfall Sewer during a two year frequency storm. Several methods have been formulated to aid in the development of hydrographs. Extensive work was done by Horner and Flynt[2] in St. Louis, Missouri, and by Hicks[3] in Los Angeles, in the 1930's. The method of pattern design storm hydrographs is currently used by the City of Los Angeles and several surrounding communities.

After the end of World War II, the City of Chicago embarked on an extensive sewer construction program estimated to cost $165,000,000. It was felt by their engineers that the expenditure of such a great deal of money could not be based on the Rational Method, so extensive work was done to develop a more exacting method of computing storm water runoff. The results of this study have become known as the "Chicago Hydrograph Method". It was devised for use in urban areas where more accurate and detailed analysis is warranted. The results of this study are presented in the paper "The Hydrology of Urban Runoff" by A. L. Tholin and Clint J. Keifer[1]. The procedure which they developed was outlined in their paper as follows:

Step	Description
1	Determination of the typical layout of the drainage areas.
2	Determination of chronological storm pattern or hydrograph of a Design Storm.
3	The evaluation of the abstractions from rainfall.
4	The determination of runoff hydrographs at the lower end of elemental strips of both pervious and impervious ground surfaces and roofs.



QUEEN OUTLET
2 YEAR HYDROGRAPH

KLLC10562

5 Routing of the mixed flow from the elemental strips of pervious and impervious ground surfaces along the channel of the street gutter to the inlet or catch basin grating.

6 Routing of the sewer supply hydrographs from roofs and street inlets along a typical headwater sewer lateral.

7 Routing of the lateral outflow hydrograph by a time-offset method along the submains and main outlet sewers to the point of discharge of the sewer system.

8 The production of a series of easy-to-use design charts.

This procedure has become the basis for the Newark Drainage Model. A computer program has been written to process steps 4, 5, 6 and 7. Several modifications of the detailed procedure used for the City of Chicago have been made to meet the conditions in Newark. A step-by-step description of the hydrologic analysis and computer program logic follows.

The NDM has been written in Fortran IV for use on an IBM 1130 with 8K storage. Because of the size and relative speed of the machine it has been imperative to minimize active storage requirements and to use several calculation saving assumptions. The most important assumption is that development within the City of Newark can be classified into a relatively small number of hydrologically similar unit areas. Once this is accomplished runoff hydrographs can be developed for each of the typical unit areas drained by a typical Lateral Sewer System. The hydrographs from each of these typical areas can then be added to each other as needed to match the type of development tributary to each particular interceptor sewer. By so doing the design of an interceptor sewer will be based on exactly the type of development that is present.

The NDM consists of three major subprograms. The first two subprograms, Surface Drainage and Lateral Sewer Routing, are linked directly together and are run as a unit. In combination these programs produce runoff hydrographs for a typical hydrologic area of from two to twenty acres, and write the hydrographs into a disc file.

The third subprogram, Interceptor Sewer Routing, recalls the unit hydrographs from the file, and then combines and routes the flows and produces hydrographs at selected locations along the Interceptor. The hydrographs that are produced yield not only the peak flow but show the entire runoff pattern. The following list describes the steps taken by each subprogram to produce the final hydrographs.

Subprogram Surface Drainage

Step	Description
1	Read Rainfall Hyetograph
2	Calculate cumulative mass rainfall
3	Determine offset time for infiltration mass curve
4	Subtract infiltration
5	Subtract surface depression storage
6	Overland flow routing for pervious surface, impervious lot area and street area
7	Apply percent imperviousness and tributary area to determine gutter inflow
8	Route flow through typical gutter
9	Add flow from roof leaders to determine catch basins flow to lateral sewer.

Subprogram Lateral Sewer Routing

Step	Description
1	Read catch basin inflow
2	Determine lateral sewer size from tributary area and street slope.
3	Calculate flow capacity and storage volume table for lateral sewer based on normalized flow depth.
4	Route flow through each reach of the typical lateral sewer system using a modified storage-lag method.
5	Write lateral sewer outflows to disc file.

Subprogram Interceptor Sewer Routing

Step	Description
1	Read lateral sewer outflow hydrograph based on hydrologic properties and unit area from disc file.
2	Combine to upstream routed hydrograph.
3	Calculate flow capacity and storage volume table for sewer reach based on normalized depth of flow.
4	Route flow through sewer reach using a modified storage-lag method.
5	Print the hydrograph.

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Subprograms Surface Drainage and Lateral Sewer Routing must be run for each of the typical hydrologic unit areas. Subprogram Interceptor Sewer is then run for each interceptor sewer to accumulate the flows from each of the unit areas. A detailed description of the theoretical consideration involved in each of these steps follows:

A few other computer programs have recently been written to perform a similar type runoff hydrograph analysis. Two in particular were reviewed during the time when the NDM was being developed.

The first, "Storm Water Management Model" prepared for the Environmental Protection Agency[9] is an extensive program which analyzes runoff quality as well as quantity. The second, "Urban Runoff Characteristics", also prepared for the Environmental Protection Agency[10], analyzes only storm runoff. These two programs and the NDM all generally follow the Chicago Hydrograph Method as outlined by Tholin and Keifer[1]. The Newark Drainage Model Computer Program has been written so that it can be processed entirely on an IBM 1130. Each of the other programs requires at least partial processing on a larger machine such as the IBM 360/65. The NDM has a definite advantage since the IBM 1130 is a machine that is readily available. However, the greatest advantage of the NDM is that the time increments of the rainfall hyetograph can be varied throughout the storm's duration. If uniform time increments were required either a tremendous number of increments would be required or the accuracy of defining the peak intensity would be lost. Through trial runs it has been found that if a maximum change or 20% in rainfall intensity between time increments is allowed quite good results are obtained. It is also desirable to minimize the number of changes in the time increment as it requires additional calculations and has a minor effect on accuracy. At the present time the NDM program is relatively basic and is not capable of handling many conditions such as multiple barrel conduits or backwater conditions. These are presently being analyzed by hand, but in the future, as a greater need arises, they could be included in the program.

RAINFALL LOSSES

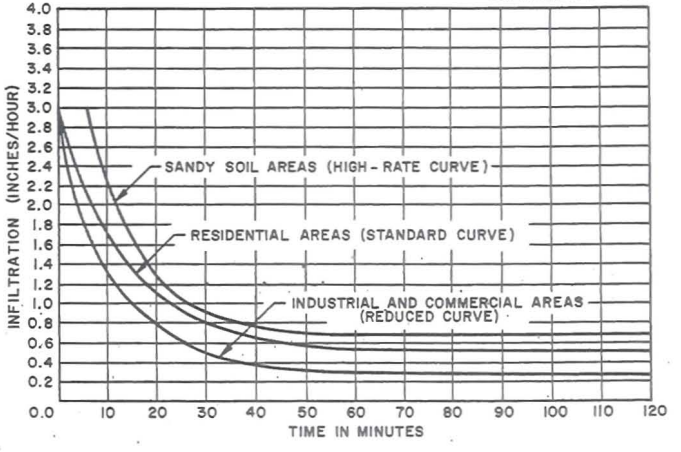
The rainfall intensity is related to the runoff volume in the rational formula by the runoff coefficient, C. This single value is replaced in the hydrograph method by time dependent equations which relate rainfall to runoff. The time dependent equations consider the fact that the abstractions from rainfall can vary during the storm duration. The two factors which have a significant effect upon determining the portion of the rainfall which runs off are infiltration and depression storage.

Infiltration is defined as the entry of water into the ground and its percolation down to the water table. The amount of rainfall which goes into infiltration is obviously not available to runoff. The earth acts as a sponge to varying degrees depending on soil characteristics and the land surface coverage. Sandy soil readily absorbs water while clay soils are not as absorbent and pave areas allow practically no infiltration. The surface layers of soil may become saturated at which time the rate of infiltration is greatly reduced and surplus water begins to pond in surface depressions or small irregularities. Eventually, these surface depressions overflow, and an overland flow path is established to the gutter or inlet.

Infiltration

Infiltration occurs on pervious surfaces which can absorb moisture. Exhibit 31, Standard Infiltration - Capacity Curves for Pervious Surface, was presented in the American Society of Civil Engineers Manual 37, Design and Construction of Sanitary and Storm Sewers. Horton[4] derived the general form of the equation and Jens[3] established the constants for general soil conditions.

EXHIBIT 31



STANDARD INFILTRATION-CAPACITY CURVES FOR PERVIOUS SURFACE

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Infiltration capacities for the study area are determined by the following equations:

$$f = 0.53 + 2.47e^{-0.0697 t_f} \qquad A$$

$$f = 0.265 + 2.47e^{-0.0697 t_f} \qquad B$$

When f is the rate of infiltration in inches per hour and tf is the time in minutes measured from the beginning of the infiltration capacity curve.

Equation A corresponds to the curve for residential areas (standard curve) on Exhibit 31, and was used for light residential areas, parks and cemeteries. Equation B approximates the curve for industrial and commercial areas (reduced curve) on Exhibit 31 and was used for all other areas. It can be noted (from Exhibit 31) that the infiltration rate is dependent upon the antecedent rainfall for about the first 60 minutes after which the infiltration rate becomes constant. Tholin and Keifer[1] further suggested that the infiltration capabilities of soil are cumulative. On this basis they suggest that the cumulative mass infiltration must also be satisfied prior to the initiation of runoff. In simpler language this means that two conditions must be met before runoff begins. First, the mass rainfall must equal or exceed the mass infiltration capacity and second, the instantaneous rainfall intensity must exceed the rate of infiltration. Tholin and Keifer[1] solved for these conditions using a graphical procedure. The cumulative mass rainfall and cumulative mass infiltration vs. time curves are first drawn to the same scale. The mass infiltration curve is then shifted along the time axis until it is tangent to the mass rainfall curve. At this point both conditions are met since the ordinates, representing the cumulative volumes, are the same and the slope of the two curves, representing the intensities, are the same.

This time shift for the infiltration curve is extremely important for storms of short duration. If the storm peak occurs during the early part of the storm the runoff can be greatly reduced by the higher rate of infiltration. However, if the storm duration is long the peak intensity will probably occur when the infiltration rate is substantially reduced.

The Newark Drainage Model Computer Program determines the infiltration curve offset for any rainfall hyetograph that might be used. A mathematical procedure similar to the graphical solution described above has been utilized.

Depression Storage

The second major factor which influences the quantity of runoff is surface depression storage, which occurs on both pervious and impervious surfaces. The irregularities in a lawn or on a parking lot are examples. The shallow depressions fill rapidly and overflow into other depressions. Eventually all depressions are filled and runoff begins. The depth of these depressions has been assumed to average 0.5 inches on pervious surfaces and 0.125 inches on impervious surfaces. The rate of overflow from depression storage has been approximated by the following equation.

$$R = (i-f)\left[1 - e^{-\frac{P-F}{S_d}}\right]$$

where:

R = Overland flow supply
P-F = Mass rainfall less mass infiltration
Sd = Overall volume of depression storage available
i-f = Rainfall intensity less infiltration rate

This equation was cited by Tholin and Keifer[1] and is considered to be a reasonable approximation of the action of depression storage. It has therefore been incorporated into the Newark Drainage Model Computer Program. The infiltration is first subtracted from the rainfall and then the depression storage equation is applied to the excess. Both of these rainfall abstractions are permanent in their effect on the storm runoff. The remaining considerations are only temporary in that they retard and store flow but eventually release it.

SURFACE RUNOFF AND ROUTING

Infiltration and depression storage are not affected to any major degree by minor changes in either the land slope or drainage pattern. The effect of a change in land slope from 0.5% to 5.0% is for all practical purposes undeterminable. However, the effect of land slope and drainage pattern on overland flow routing gutter routing, and lateral sewer routing is significant. The drainage pattern which best conforms to the existing development in Newark is shown on Exhibit 20. The land has been assumed to slope from the back of the property toward the front as previously discussed. A straight

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line flow path has been assumed between the rear property line and the gutter. This assumption will yield slightly conservative results as in actuality the rain which falls in the middle of the rear yard must flow around the building and down the side yard to the gutter. This has been partially compensated for by assuming that the building and other areas directly connected to the lateral sewer, extend from the rear property line to the curb.

The overland flow distance and land slope have a great effect upon the time of travel and surface retention. The shorter the flow length or the steeper the land slope the smaller the time of travel and surface retention. As the time of travel and surface retention are decreased the runoff increases.

The gutter flow length and street slope have the same effect upon the routing through the gutter and routing through lateral sewers. The steeper the street the greater the flow velocity which results in reduced retention and increased flows.

Overland Flow Routing

As the first depressions fill and begin to overflow a sheet of water builds up on the surface. The depth of this sheet of water is dependent upon the rainfall excess, or that volume of water left after infiltration and depression storage. The greater the rainfall excess, the greater is the required thickness of the sheet flow to carry it across the surface to a gutter or inlet. As the rainfall excess is increasing a portion of the flow is retained on the surface to build up the depth of sheet flow. Thus, the sheet flow depth requires a certain volume of water, called Surface Retention, which under increasing flow conditions can be subtracted from the runoff. When the conditions reverse and the rainfall excess is decreasing the sheet flow depth is decreasing and this volume is added to the rainfall excess.

Tholin and Keifer[1] used Mr. Carl F. Izzard's[7] analysis of the flow of water across developed land. The analysis was based on steady state flow but it is our opinion and the opinion of Tholin and Keifer that the results of gradually varied flow equations would not differ significantly. The equation as derived by Izzard follows:

$$D = 0.342\left[\frac{0.0007i+C}{S_0^{1/3}}\right]l^{1/3}q^{1/3}$$

where:

D = Surface detentions, inches
i = Rainfall intensity, inches/hour
C = Izzards Surface Roughness Coefficient
So = Land Slope, feet/feet
l = Overland flow distance, feet
q = Average outflow from unit land strip, inches/hour

The surface detention or sheet flow depth is thus defined for a particular set of conditions and a particular rainfall and rainfall runoff rate. As the rainfall varies throughout the storm so does the surface retention. The principle of continuity states that the average outflow for any time increment must equal the inflow less the surface detention for that time increment. The application of this principle and the overland flow routing equation of Izzard make it possible to solve for the gutter supply from each land area. Tholin and Keifer[1] combined these to form the following Routing Function which accounts for storage and outflow.

$$F(q,i,\Delta t_0) = \frac{q}{2} + 20.5\left[\frac{0.0007i+C}{S_0^{1/3}\Delta t_0}\right]l^{1/3}q^{1/3} \qquad C$$

The variables are the same as in the previous equation with Δ to representing the time increments in minutes. Because of the relatively complex nature of this function Tholin and Keifer chose to solve the equation for typical conditions, plot them, and then use a graphical solution. Both q and the value of the function are unknown but the value of the function can be solved for in the routing equation which is as follows:

$$\bar{Q} - q_1 + F_1 = F_2 \qquad D$$

where:

Q = Average inflow over time increment being considered
q_1 = Outflow at beginning of time increment
F_1 = Routing function at beginning of time increment
F_2 = Routing function at end of time increment

Once the routing function at the end of the time increment is determined, the outflow can either be obtained graphically, as done by Tholin and Keifer, or mathematically.

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The Newark Drainage Model Computer Program solves these equations mathematically. The value of the routing function, F_2, is first determined by solving the routing equation (D). The magnitude of the outflow and surface retention are then calculated from Tholin and Keifer's modification of Izzard's Equation (C). This is accomplished by using Newton's Iteration method for the solution of general nonlinear equations in a subroutine generally as programmed in the IBM Scientific Subroutine package.

Three sets of overland flow routing calculations are performed; the first for the pervious grassed areas, the second for the impervious roof top and paved areas, and the third for the strip of the street from the center line to the gutter. The flow from these strips is assumed to enter the gutter uniformly, based on the relative percentage of each, throughout its length. The roof top and paved areas which are directly connected to the lateral sewer are also assumed to be uniformly spread along the gutter but have been assumed to be carried directly into the manhole at the end of each lateral sewer reach.

GUTTER ROUTING

The overland flow has been assumed to enter a gutter uniformly throughout its length. Thus, the flow begins at zero at the upper end of the gutter and increases uniformly until it reaches its maximum at the catch basin. Tholin and Keifer made a thorough analysis of the relationship between the inflow, outflow and gutter storage. They set the relationship up in the form of a function as was done for the overland flow.

The Equation is as follows:

$$F_g(Q,I,\Delta t_o) = \frac{Q}{2} + \frac{n^{3/4} Z^{1/4} L_g}{60 \Delta t_o 2.26 S_g^{3/8}} \left[\frac{4}{11} I^{3/4} + \frac{7}{11} Q^{3/4} \right] \quad E$$

where:

- F_g = Gutter routing function
- Q = Gutter outflow, cfs
- n = Gutter friction factor
- Z = Road Crown slope, feet horizontal/one foot vertical
- l_g = Length of Gutter, feet
- Δt_o = Time increment, minutes
- S_g = Slope of gutter, feet/feet
- I = Total overland flow supply, cfs

The value of the function can again be computed by using Equation D, the routing equation. Tholin and Keifer set up a graphical solution for the gutter function as they had for the overland flow equation. We programmed the NDM to solve this equation using Newton's Iteration Procedure.

The routed gutter flow is then added to the flow coming from roof leaders and other areas assumed to be directly connected to lateral sewer manholes. The resulting hydrographs are then read into a file for use by the Lateral Sewer Routing subroutine.

To this point the NDM has generally followed Tholin and Keifer's procedure. The only major exceptions were the method used to develop the hyetographs and the equation used for depression storage. The development of typical hydrologic unit areas, the infiltration curves, the offset of the infiltration curves, the overland flow routing procedure and the gutter routing procedure were all presented by Tholin and Keifer. The Newark Drainage Model Computer Program processes these procedures automatically, saving tremendous amounts of time. The final three steps outlined by Tholin and Keifer were lateral sewer flow routing using the time offset procedure, interceptor sewer flow routing using the time offset procedure, and the development of easy to use peak flow design charts. The NDM has been programmed to route both the lateral and interceptor flow using a storagelag procedure. This has been done because of the resulting peak flow reduction and the more accurate hydrograph shape.

LATERAL SEWER ROUTING

In a previous section of this report several hydrologic considerations have been shown to be quite consistent throughout the City. The lateral sewer system also follows this pattern. The inflow to each lateral sewer has been assumed to occur at the manholes where catch basin connections are made. These manholes have generally been located 325 feet apart and have also been assumed to be the only locations where pipe size changes can occur. Each lateral sewer system drains from two to twenty acres assumed to be located uniformly on each side of the street throughout the sewer length. Each catch basin drains approximately one acre which results in two acres, one from each side of the street, being tributary to each lateral sewer manhole.

The analysis is begun at the uppermost manhole. The hydrograph for the two acres tributary to this first pipe is routed through it to the second

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manhole. The hydrograph from two additional acres is then added and the combined hydrograph routed to the third manhole. This procedure is continued until ten lateral sewer reaches, have been analyzed. The hydrograph at each manhole is written into a disc file for recall by the interceptor sewer subprogram.

A storage-lag routing procedure has been used to analyze the flow through lateral sewers. The routing procedure and some of the basic programming were taken from the "Hydrograph Combining and Routing" Generalized Computer Program developed by the Hydrologic Engineering Center of the U.S. Army Corps of Engineers[8]. **The routing is done in two separate steps. First, the lateral sewer flow storage is analyzed by using a modified reservoir routing procedure and second, the "Lag" or travel time through the conduits is accounted for by delaying or offsetting the storage routed hydrograph by the average time of travel through the conduit. By so doing, complete advantage is taken of all factors which reduce the peak instantaneous flow.**

Four typical lateral sewer designs have been built into the NDM. By so doing, it is not necessary to consider each sub-area drainage system individually. The street slope, tributary area, and land use are the three factors which determine which of the four typical designs will be selected.

The first step in the lateral sewer routing procedure is to select the conduit size by checking the input land use, tributary area and street slope. The lateral storm sewer slope is assumed to be the same as the street slope and this slope is then used in Manning's equation to generate a table of flow capacity and storage volume versus depth of flow. This tabulation of normalized flow depths is then used to calculate the flow routing characteristic which is the sum of one half of the discharge rate and the storage volume divided by the routing time increment. The sewer hydrograph is then storage routed by successive solution of the routing equation which follows:

$$(S_2 + O_2/2) = (S_1 + O_1/2) + I_{1,2} - O_1$$

where:

S_2 = Storage volume at end of time increment
O_2 = Outflow at end of time increment
S_1 = Storage volume at beginning of time increment
O_1 = Outflow at beginning of time increment
$I_{1,2}$ = Average inflow during time increment

As the new flow routing characteristic is determined for each time increment the outflow is determined by interpolation in the normalized flow depth tabulation previously generated for this lateral sewer reach.

The final step in the lateral sewer routing procedure is to offset the storage routed hydrograph. This is done by determining the time of travel between manholes, based on the average velocity, and offsetting or delaying the hydrograph by that time increment. The inflow hydrograph for the next two acre unit is then added and the routing procedure repeated.

The hydrograph for each manhole, in 2 acre increments, is then stored in the disc file to be recalled by the interceptor sewer routing program.

INTERCEPTOR SEWER ROUTING

The third subprogram of the Newark Drainage Program, Interceptor Sewer Routing, accumulates the lateral sewer flows and routes them through the interceptor sewer. The same routing technique is used for the interceptor sewers as was applied to the lateral sewers. The input to this program is the assumed interceptor sewer pipe size, slope, length, directly tributary area, and a code number for the lateral sewer hydrograph file. Based on the code number and tributary area the program will select a hydrograph for the proper land use, and overland flow characteristics and of the proper tributary area. This directly tributary area hydrograph is then added to the hydrograph from the upstream interceptor and routed using the modified storage-lag routing procedure as described in the lateral sewer routing section of this report. The procedure is followed for each reach of the sewer and hydrographs are obtained for each interceptor sewer, manhole or junction chamber where the flow from a lateral sewer is added.

SEWER GAGING PROGRAM

The Sewer Gaging Program which has previously been described in Chapter III was also originally designed to provide rainfall hydrographs which could be utilized to verify the hydrographs developed by the Newark Drainage Model Computer Program. We were hopeful that reasonable rainfalls would occur during the periods in which the sewer gages were installed at the various gaging locations and hopeful of correlating these rainfall hydrographs to output from the Newark Drainage Model Program. For several reasons, we found this to be impractical.

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The rainfall could not be recorded with sufficient accuracy in these relatively small drainage basins to provide a good correlation to flow. Accurate rainfall recording instruments were found to be quite expensive and could not be justified for this project. An attempt was made to utilize the precipitation records recorded at the Newark Airport, but it was found that the relatively great distance from the recording station to the sewer gaging locations made it impossible to obtain an accurate correlation.

An attempt was also made to record runoff hydrographs at the Peddie Diversion Chamber and compare those with computed hydrographs using the Newark Drainage Model Program. A reasonable correlation could not be achieved at this point because of the variation of rainfall over the watershed, the fact that the gaging was done upstream of the tide gate, which created backwater conditions, and the fact that the downstream ditches surcharge creating a backwater condition which prohibits correlating depth of flow to runoff intensities.

In addition, there were very few storms with a consistent rainfall pattern suitable for modeling and subsequent utilization in checking the hydrographs developed by the Newark Drainage Model Program.

NEWARK DRAINAGE MODEL VERIFICATION USING EPA STORM WATER MANAGEMENT MODEL

Concurrent with the development of this report, the Federal Environmental Protection Agency has been developing a Storm Water Management Model Computer Program. This computer program has been published by EPA in a four volume report which is dated August 1971. During the initial phases of the Newark Pollution Abatement Plan Study, an attempt was made to find a computer program which would perform the hydrograph analysis for the storm drainage within the City of Newark. At that time no such program was available and on that basis the Newark Drainage Model Program was developed because it was considered essential that this type of analysis be used to verify the results obtained from the Rational Method. The Environmental Protection Agency Storm Water Management Model Program was subsequently printed and made available in mid-1972. This program has undergone some verification and testing throughout the country, which has shown it to be a valuable tool in analyzing storm water runoff.

The EPA program models water quality as well as runoff quantity. Verification of the program has been limited, however, to the runoff sub-routines of the program.

Since this program became available, we felt it worthwhile to run "benchmark comparisons" between the Newark Drainage Model Program and the Storm Water Management Model Program. Our feeling is that a close correlation will reinforce the validity of each program.

An investigation was made to determine the difference in the methods of computing the runoff hydrographs. The major differences are that the Newark Drainage Model Program was set up so that the inflow rainfall hyetograph could be input at varying time increments. The Storm Water Management Model Program requires that the rainfall hydrograph be input with constant time increments. The advantage of the variable time increments is that during constant rainfall rates input increments can span a long period of time. For instance, in the initial rainfall period where the rate may vary only from .1 inches to .12 inches in a period of 30 minutes, only two entries would be required. Under the Storm Water Management Model Program a constant time increment would be required; for instance, if three minute increment was used, ten entries would be required for the thirty minute period. During the peak rainfall period the peak intensity can be more closely defined with the variable time increments of the Newark Drainage Model Program. For instance, in the input hyetographs used for the analysis of the Newark system, 30 second increments have been used to define the most intense periods. With the Storm Water Management Model Program, the intense rainfall period must be defined with the same time increment as the initial low rate of rainfall. Thus, the Newark Drainage Model Program can provide a more accurate description of the rainfall hyetograph, generally with a greatly reduced data file.

The Newark Drainage Model Program is set up for a patterned system of overland flow, gutter flow and lateral sewer flow. The Storm Water Management Model Program requires that each of these items in each particular basin be defined individually. Thus, to obtain the same detail in the runoff pattern the Storm Water Management Model Program would require a tremendous amount of input. For the "benchmark" runs, the required data was input to essentially achieve the same runoff pattern for both programs. It was determined that in the normal running of this program much less detail is input than was utilized this "benchmark" run. A normal run of the Storm Water Management Model Program is taken on a much coarser, or larger, tract than the Newark Drainage Model with its patterned runoff.

The basic equations which were used to compute the runoff routing over the pervious and impervious surfaces were essentially the same. The gutter routing and lateral sewer routing sub-routines of the Storm Water Manage-

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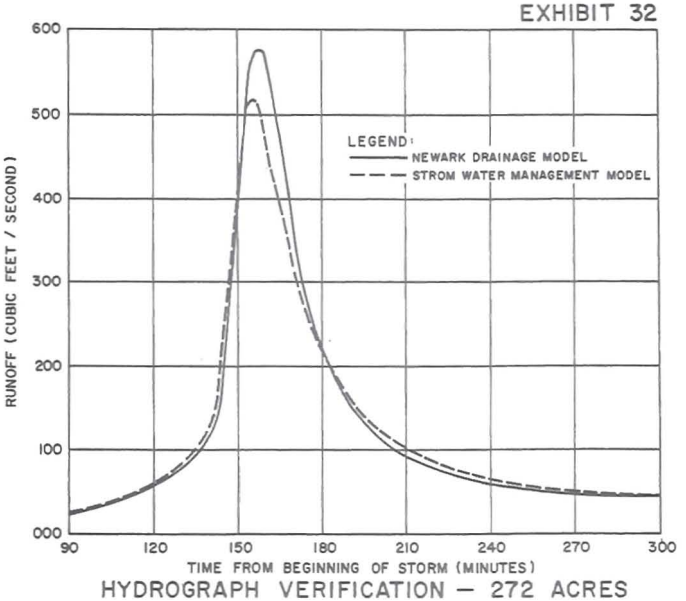
ment Model Program again were quite similar to those used in the Newark Drainage Model Program. However, there were some minor differences.

The interceptor routing sub-routine of the Storm Water Management Model Program was set up to handle many conditions that the Newark Drainage Model Program cannot handle. For example, the Storm Water Management Model Program will handle branching pipe systems and backwater and weir flow conditions. These types of facilities are not particularly common in the Newark Sewer System and, therefore, it was not considered essential to include them in the interceptor routing program.

As has been stated, there are several differences between the two programs which would lead one to believe that there may be a substantial difference in the end result. However, when the results were compared as shown in Exhibits 32, 33 and 34, it can be seen that a very close correlation does exist between the results of the two programs. The hydrographs which have been plotted are the runoff hydrographs from areas within the Peddie Drainage District. It can be seen that the larger drainage area has the closest correlation. This would be anticipated in that the basic assumption of the most commonly used Rational Method is that runoff can be related to average rainfall intensity over a large area. The variations in the input rainfall hyetrograph and the variations in the method of computing the overland flow are most pronounced in the smaller watersheds. The Newark Drainage Model Computer Program has been set up to provide an accurate analysis of the first lateral sewer as well as the larger systems. This has been accomplished through the patterned procedure used for the runoff design. The Storm Water Management Model Program has primarily been established to provide an analysis of the larger drainage systems. The time offset method of hydrograph routing which has been used in the Storm Water Management Model Program provides a relatively accurate answer with the larger areas. The Newark Drainage Model Program has used a modified storage lag procedure within the lateral and storm sewers which should provide a more accurate answer in all areas.

The final result of this "benchmark" run is that the Newark Drainage Model Program has been shown to generate a peak which is slightly higher and generally occurs slightly later than that derived by the Storm Water Management Model Program. The difference in computed time, however, is only a very few minutes and the difference in the magnitude of the peaks is always within 10%. It is our feeling that on this basis both programs, written independently and with slightly different objectives in mind, serve well to prove the modeling efficiency of the other.

EXHIBIT 32



HYDROGRAPH VERIFICATION — 272 ACRES

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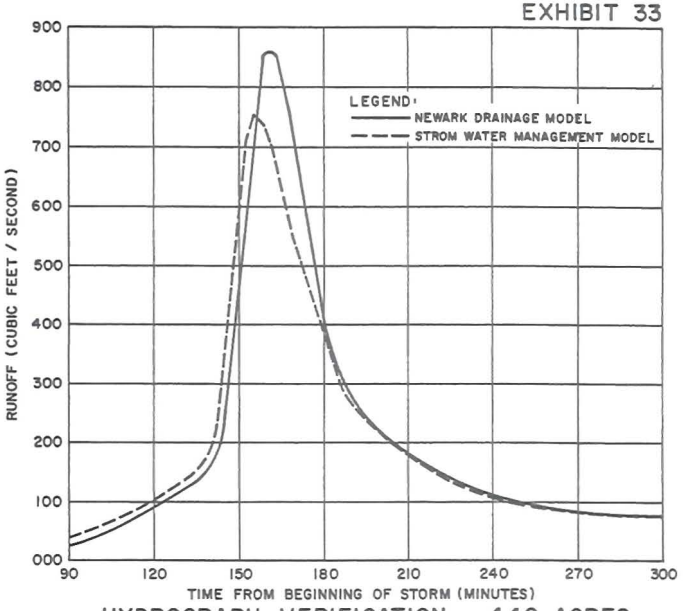
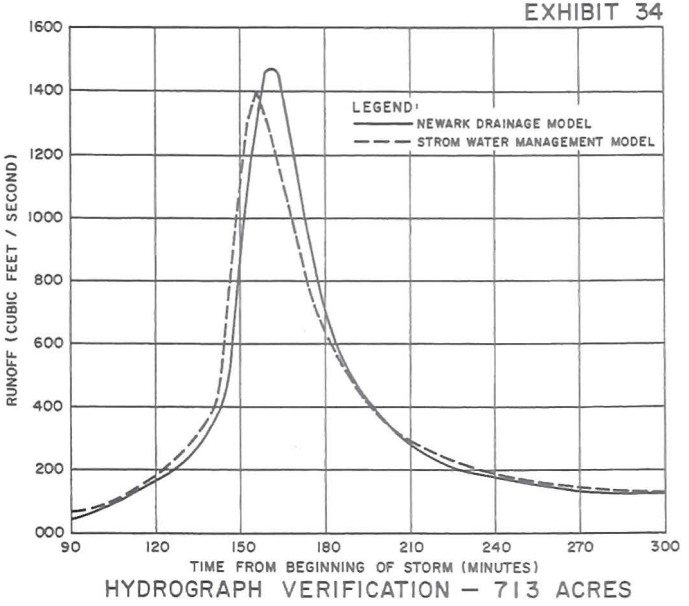
EXHIBIT 33



HYDROGRAPH VERIFICATION — 442 ACRES

EXHIBIT 34



HYDROGRAPH VERIFICATION — 713 ACRES

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CHAPTER VI — DESIGN CRITERIA

BASIS OF DESIGN OF SEWER SEPARATION

Two methods have been proposed to eliminate the pollution problem resulting from the City of Newark's combined sewer overflows. This Section will describe the conventional method of pipe system separation. The general scheme is to provide new sanitary interceptor sewers to which existing lateral sewers will be connected. All existing roof drains and catch basins will be separated from the existing lateral sewers and connected to new storm sewer laterals.

The new storm laterals will then be connected to the existing combined interceptor sewers which will be converted to storm sewers. A rather detailed preliminary design was prepared for the proposed sanitary sewers to establish accurate cost estimates. Lateral sewers were priced on a cost per acre basis as were the plumbing changes in existing structures. The sanitary sewer system was designed on the basis of the dry weather flow predicted for the year 2020 as described in Chapter III of this report.

BASIS OF STORM WATER DESIGN

This report deals with the two related problems of storm drainage and sanitary waste. The conceptual design of the major storm drainage facilities to be discussed in this Section is compatible with either a sewer separation plan or the proposed combined sewer overflow treatment facility.

As previously noted, the Rational Method is the most commonly used and most widely accepted procedure for determining storm flows. The New Jersey Department of Environmental Protection, Division of Water Policy and Supply, which is the prime reviewing agency for drainage works with the State generally uses the Rational Method.

The general design criteria which has apparently been utilized in the City of Newark throughout the years is in the order of a 5 year frequency Rational Method design flow. On the basis of our investigations, the Rational Method of Analysis using a 5 year frequency storm does generate a resonable design flow which can be economically justified. In addition, field checks during intense storms in 1971 and 1972, and liaison with the Newark Bureau of Sewers have verified that in general, flooding does occur in those areas where flooding has been predicted by the results of our analysis. In like manner, our analysis generally predicts no flooding in those areas where the City has not experienced flooding problems with the existing system.

Although our recommended design is generally based on a 5 year frequency storm, local conditions and economic realities have in some cases mandated a lower degree of protection. In these restricted areas a minimum 2 year frequency storm has been used in the development of the designs presented herein.

The Newark Drainage Model Computer Program was also utilized to generate design flows for each of the major basins in the City of Newark. These include all of the basins tributary to the airport; namely Peddie, Queen, Wheeler and Adams. Several frequencies of hydrographs were generated for each of these basins. For 5 year frequency storm, flows obtained from the Newark Drainage model were generally 50 to 75 percent greater than those obtained using the Rational Method. The Interim Report generally utilized the concept of 5 year frequency hydrograph design flow, which indicated a tremendous amount of reconstruction to satisfy design conditions. It has subsequently been determined that a 2 year frequency design storm from the Newark Drainage Model on the average is equivalent to approximately a 5 year frequency runoff using the Rational Method.

Runoff hydrographs were developed for the Raymond, Saybrook and Millbrook districts as well as the basins tributary to the airport and were plotted on a c.f.s. per acre versus tributary area basis. This set of curves reflected the various flows that would be generated by the varying land use and varying topography throughout the City. The City of Newark has basically been divided into three categories topographically; flow areas with less than 1% slope; areas with 3-5% slope; and steep areas with greater than 5% slope. It was found through our analysis that slope has a tremendous influence upon the peak flow to be developed by a watershed. This is primarily because the steeper the slope the faster the overland flow will travel and also since the storm sewers generally parallel ground surfaces, the steeper the sewer slope, the greater the velocity and shorter the time of concentration in the lateral and interceptor sewers. It has generally been

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found that a variation from a flat slope to a medium slope or a medium slope to a steep slope would increase the peak design flow by an amount equivalent to a 20% increase in impervious surface coverage of the area. Basically what that means is that in the medium grade or 3% residential R-3 development which has approximately 65% impervious surface coverage, the peak flow developed is very close to that which is developed in an industrial area with 80% impervious surface coverage where there is a flat slope of 1.% or less. Attempts were made to try and generalize runoff by land use. It was found quite difficult since an increase in slope from 1% to 3% could make as much as a 20% difference in the peak flow. Runoff hydrographs were developed for nearly all land uses and many were found to be either repetitious, or to have only insignificant differences from others. Ten distinct land uses or typical topographic areas have been defined as follows:

1. 1% Slope Residental R-1
2. 1% Slope Residential R-2
3. 1% Slope Residential R-3
4. 3% Slope Residential R-4
5. 1% Slope Industrial
6. 3% Slope Park or Cemetery
7. 5% Slope Residential R-4
8. 1% Slope Park
9. 1% Slope Core Commercial
10. 3% Slope Industrial

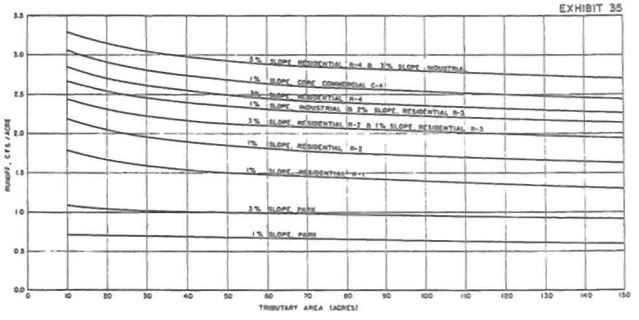
Exhibit 35, Conceptual Design Curves, presents the peak runoff intensities for small areas of each of these land uses.

There are several small drainage basins within the City of Newark which have not been analyzed using the Newark Drainage Model Computer Program. A simplified hydraulic analysis was felt to be justifiable where flood problems had not been reported, and the conceptual design curves were utilized in these cases.

BASIS OF COST ESTIMATE

Cost estimates will be prepared for the sewer system separation, but only the cost of installing the interceptor sewers will be evaluated in detail. All lateral sewer costs will be based on a unit cost per acre. In the residential and commercial areas where the block sizes are small, a cost of $20,000 per acre will be used while in the industrial areas where the blocks are larger a cost of $14,000 per acre will be used.

EXHIBIT 35



CONCEPTUAL DESIGN CURVES
2 YEAR HYDROGRAPH

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CHAPTER VII - SEWERAGE SYSTEM IMPROVEMENTS

PEDDIE DISTRICT

Introduction

The Peddie District lies in the southern area of the City of Newark. It extends from the Meadows area and High Street in the east to the western Newark boundary with the Town of Irvington. The elevations range from a low of +7 along the Penn-Central Railroad to +225 along the western boundary. The southern boundary of this district is along Watson and Nye Streets which is the nothern boundary of the Queen District and the approximate proposed alignment for Interstate Route 78. The northern boundary of Peddie District is generally along South Orange Avenue. Peddie District is the largest storm drainage district within the Newark Meadows basin consisting of approximately 1880 acres. It is drained almost exclusively by combined sewers, many of which are over 100 years old. The combined sewers carry the dry weather sanitary flow to the South Side Interceptor Sewer located along the Penn-Central Railroad. A regulator at the foot of Peddie Street allows flows of up to 54 c.f.s. into this sanitary sewer, which flows to the Passaic Valley Sewerage Commissioners Treatment Plant located on Wilson Avenue in the Industrial River District. However, minimal precipitation causes this regulator to overflow, discharging combined sewage into the Meadows.

As shown in Exhibit 36, the westerly boundary of the basin is along the Irvington border, and land generally slopes towards the Meadows to the east. The existing combined sewers are intercepted by conduits in Bergen Street and Boyd Street and the flow is carried southerly to Hawthorne Avenue and Peddie Street. The slope in the easterly direction is quite steep, averaging approximately 3%, which results in a rapid rate of runoff and quite high capacities in small size sewers. The cross slope drainage facilities in Bergen Street and Boyd Street are substantially flatter, generally less than 1%, resulting in a lower hydraulic capacity for the same size pipe. These facilities are generally adequate for a one or two year frequency storm and will be discussed in more detail later in this chapter.

The easterly edge of the drainage basin lies along Frelinghuysen Avenue and the Penn-Central Railroad. The elevation in this area is approximately ten to fifteen feet above mean sea level. Because of the low ground levels drainage facilities must be laid at flat slopes, resulting in low velocities and low hydraulic capacities. Separate sanitary and storm sewers have been constructed along Frelinghuysen Avenue. However, because of the inadequacies of the drainage system the flows become mixed and both facilities act as combined sewers.

Exhibits 37 and 38 show the location of major water, gas, electric and telephone conduits. This information has been compiled to provide sufficient information at the time of preliminary design to indicate the magnitude of the possible interferences which would be encountered if construction of hydraulic facilities were planned for a certain alignment. If alignments for the proposed facilities could be chosen where the interferences are minimal, substantial savings could be effected.

Sewer Separation Alternative

The combined sewers in the Peddie District convey the waste water from approximately 1600 acres of fully developed land to the Peddie Diversion chamber during dry weather periods. This dry weather tributary area is 280 acres less than the 1880 acres previously defined as the storm drainage area. The difference is due to the fact that the dry weather flow in the eastern area of the District, northeast of Charlton and Rose Streets and east of Elizabeth Avenue is intercepted in the sanitary sewer in Frelinghuysen Avenue and is conveyed to the Passaic Valley Sewerage Commissioners System by the South Street Interceptor. The development in the watershed is 63% residential, 18% industrial, 8% commercial and 11% parks and cemeteries.

The 280 acre area which is tributary to South Street will be discussed in the Adams section of the report. The present sewage flow (averaging 15.08 MGD) is conveyed to the South Side Interceptor through the existing system of combined sewers. Entry to the Interceptor is through a regulating chamber located at the end of Peddie Street. The dry weather flow collected by the Interceptor is carried to the Passaic Valley Treatment Plant at Wilson Avenue. The wet weather flow is diverted to the Peddie Ditch through the regulator gate, which closes when the Interceptor becomes surcharged. The overflow finds its way to the Peripheral Ditch and finally to Newark Bay.

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EXHIBIT 36

LEGEND

- ELEVATION CONTOUR
- DRAINAGE LIMIT
- EXISTING COMBINED SEWERS
- EXISTING SANITARY SEWERS
- EXISTING STORM SEWERS
- DRAINAGE DITCHES
- DIVERSION CHAMBER

EXISTING SEWERS
PEDDIE DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

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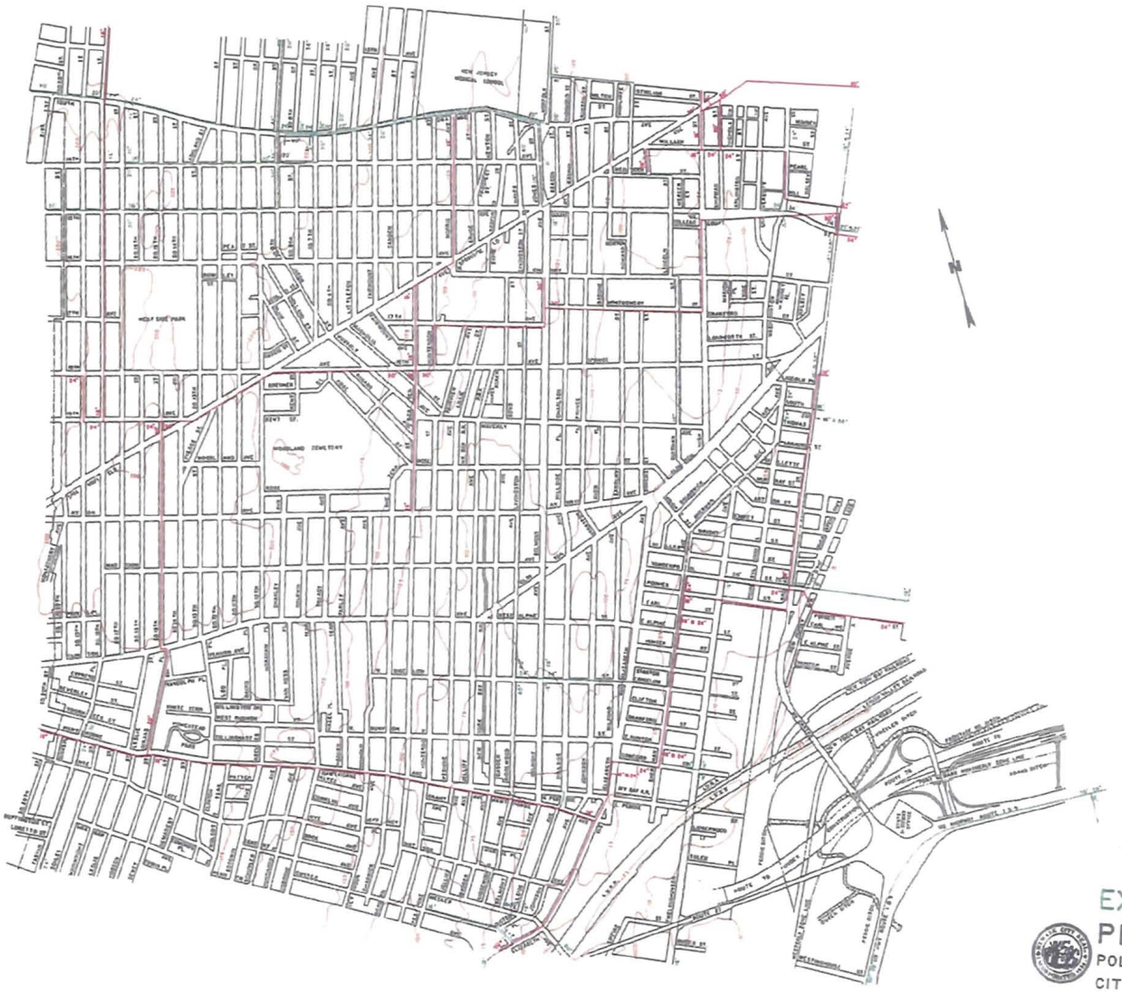
EXHIBIT 37



LEGEND
ELEVATION CONTOUR
EXISTING WATER LINES
EXISTING GAS LINES

EXISTING UTILITIES
PEDDIE DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

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EXHIBIT 38

LEGEND

ELEVATION CONTOUR

EXISTING ELECTRIC LINES

EXISTING TELEPHONE LINES

EXISTING UTILITIES
PEDDIE DISTRICT
POLLUTION ABATEMENT PLAN

CITY OF NEWARK, NEW JERSEY

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The scheme of complete sewer separation will consist of utilizing the existing combined sewer mains for the storm flows. The regulator chamber will be completely sealed off such that wet weather discharge will flow directly to the ditch, and sanitary sewage carried by a new line, will discharge directly to the South Side Interceptor.

The SEWNET Computer Program of OMNIDATA Computer Services was used to design the major sanitary sewers in Peddie District. This was convenient because the whole area is served by combined sewers. It was assumed that new sanitary sewer mains will be provided since the preliminary sanitary sewer sizes are small compared to the existing combined facilities.

For sanitary mains, new conduits will be laid following the alignment of the existing combined sewers wherever possible. The proposed sanitary sewers, however, will be laid deeper than the existing sewers not only to assure gravity collection of all sewage flow, but also to assure that house connections to the new main will not be obstructed by any of the existing sewers. Where lowering is not feasible, two lines will be installed, one on each side of the roadway. The existing laterals will generally be integrated into the sanitary system thereby retaining the majority of the house connections. Any catch basins connected into the existing laterals will be reconnected to new lateral storm sewers for connection to the storm interceptors.

The total sewage flow expected from this District is 17.1 MGD (average) and 32.5 MGD (peak).

The layout of the proposed sanitary sewer mains for the district is shown in Exhibit 39 and a detailed cost estimate for these facilities is presented in Table VII-1

It is immediately apparent that the cost of installing a separate sewer system to eliminate the discharge of combined sewage into the Bay is extremely high. These costs do not reflect the disturbance caused by the tremendous amount of construction in roadways throughout the City.

Sewer separation is expensive and will cause considerable disruption of travel on city streets. It should be considered in this District only if no other solution is feasible.

This recommendation is based largely on the extremely high cost in this district resulting from a small street grid pattern. In areas where the street grid is larger the cost of lateral sewers would become greatly reduced and sewer separation could become an economically justifiable solution.

TABLE VII-1

COST ESTIMATE
PEDDIE DISTRICT SEWER SEPARATION

Location	Pipe Sizes In Inches	Estimated Cost
So. Orange Ave.-Hayes St.-Boyd St.	12,18	$ 287,000
15th Ave.-Morris St.-W. Kinney	10,15	265,000
Boyd St.-Belmont Ave.-Waverly Ave.	10,24	387,000
Badger St.	42	1,076,000
16th Ave.-So. 13th St.	10,15,18	440,000
Springfield Ave.	15,18,21	523,000
Bergen St.-Avon Ave.-Clinton Ave.	10,21, 24,27	1,065,000
Clinton Ave.-So. 18th St.-Clinton Pl.	10,12,15	476,000
Hawthorne Ave.-Clinton Pl.	15	212,000
Runyon St.-Seymour St.	15,27,30	446,000
Hawthorne Ave.-W. Peddie	30,42	625,000
Elizabeth Ave.	15,18	421,000
E. Peddie St.-Sherman Ave.	8,60	624,000
Subtotal		$ 6,847,000
Lateral Sewer Cost 1880 acres x 18,000 =		33,840,000
Total		$40,687,000

Storm Drainage

Table VII-2 presents the existing capacity and recommended design flows for the key locations in the Peddie District. The design flows at each location have been based on the recommended improvement plan which includes a complete diversion of one-half of the watershed as shown on Exhibit 40. Runoff from the area north of Avon Avenue will be picked up by a new interceptor sewer which will discharge into reconstructed Wheeler Ditch. Even with this major diversion many of the existing conduits will be inadequate and will still require relief.

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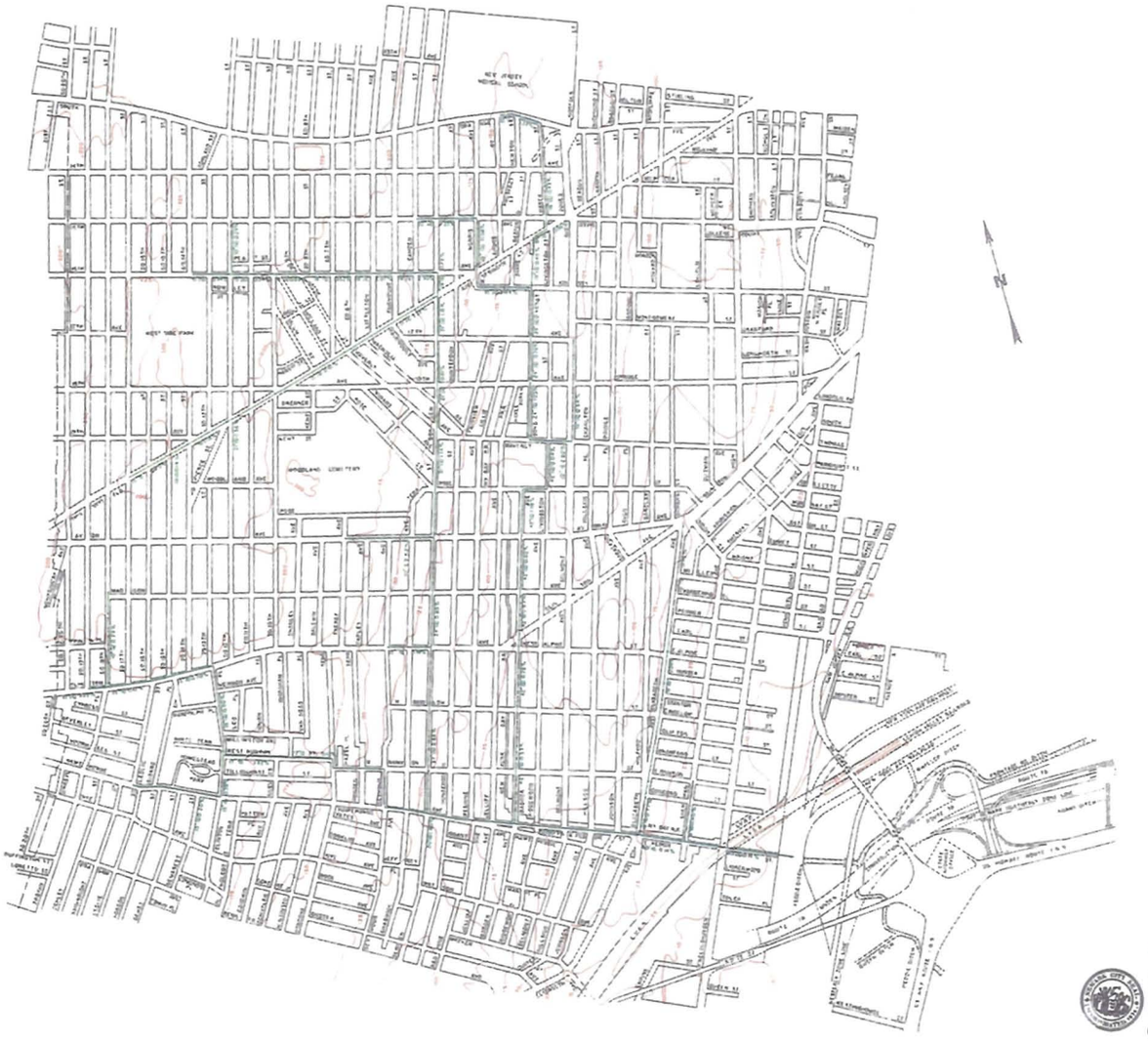
EXHIBIT 39



LEGEND
ELEVATION CONTOUR
SANITARY SEWERS

SEPARATION PLAN
PEDDIE DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

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EXHIBIT 40

LEGEND

ELEVATION CONTOUR

PROPOSED SANITARY SEWERS

PROPOSED STORM SEWERS

PROPOSED SEWERS
PEDDIE DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

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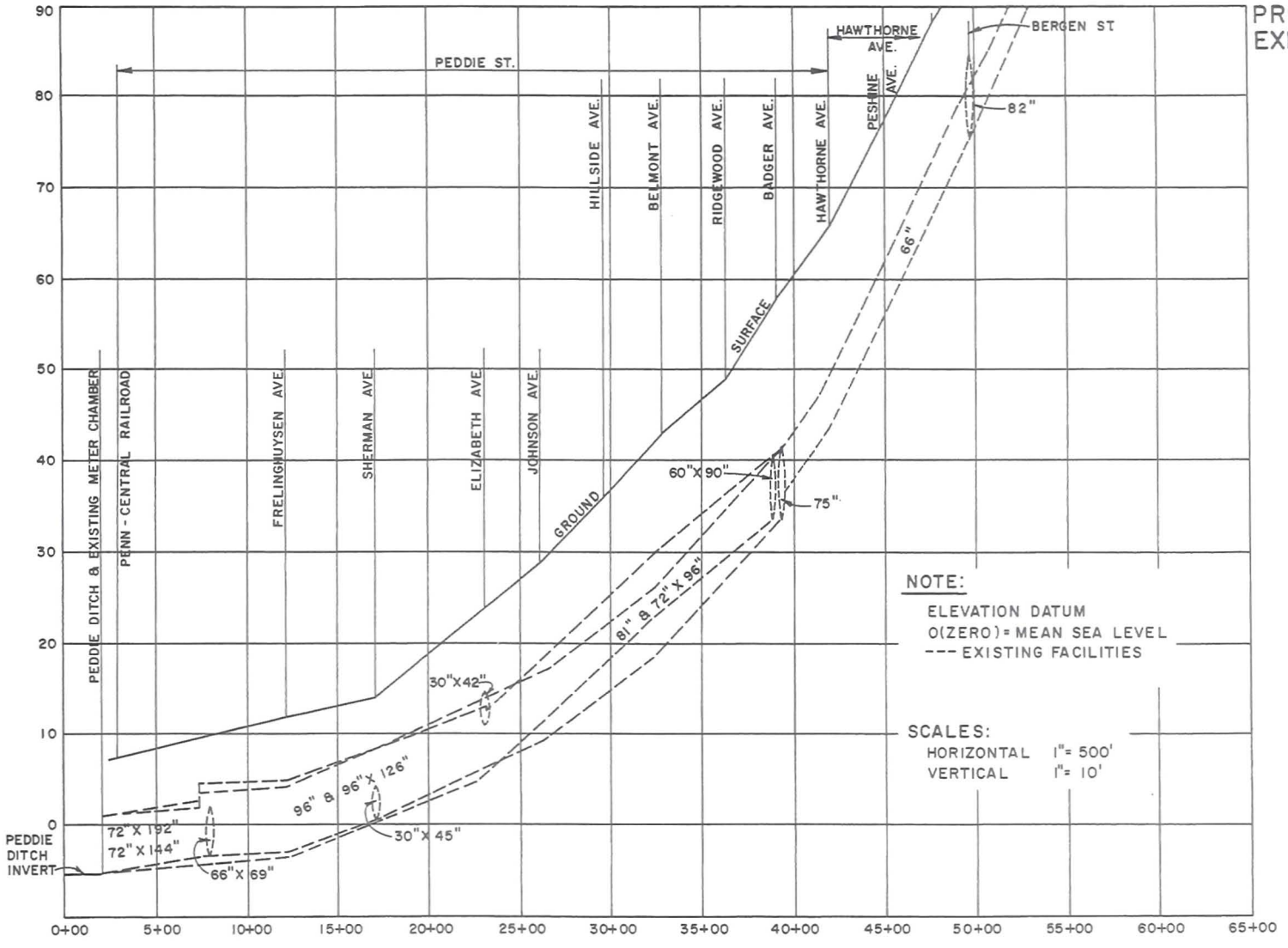
PROFILE
EXHIBIT 41



PEDDIE STREET

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TABLE VII-2

PEDDIE DISTRICT
EXISTING - SEWER CAPACITY Vs. DESIGN FLOW*

PEDDIE DISTRICT

Location	Size & Slope	Existing Capacity in cfs.	Minimum Design Flow cfs.
W. Runyon St. @ Ingraham Pl.	48" @ 1.78%	190	350
Hawthorne Ave. @ Bergen St.	50" @ 4.15%	320	450
16th Ave. @ Bergen St.	30" x 40" @ 0.90% 30" x 45" @ 2.24%	150	250
Springfield Ave. @ Bergen St.	48" x 78" @ 2.30%	450	300
Bergen St. @ Avon St.	60" x 72" @ 1.23%	220	600
Avon Ave. @ Bergen St.	24" x 36" @ 4.40%	87	120
Bergen St. @ Hawthorne Ave.	82" @ 0.87%	560	200
Hayes St. @ Springfield Ave.	36" x 54" @ 0.60% 30" x 45" @ 0.93%	145	200
Badger Ave. @ Avon Ave.	54" @ 1.05% 54" x 84" @ 1.42%	610	550
Badger Ave. @ Hawthorne Ave.	60" x 90" @ 0.70% 75" @ 0.78%	660	150
Elizabeth Ave. @ E. Peddie St.	30" x 42" @ 0.62%	42	60
Somerset St. @ Waverly Ave.	48" x 60" @ 1.75%	250	220
Earl St. @ Frelinguysen Ave.	54" x 78" @ 0.37%	160	70
Penn Ave. @ E. Peddie St.	66" x 69" @ 0.06%	85	100
E. Peddie St.-Outlet	72" x 144" @ 0.06% 72" x 192" @ 0.06%	950	1500

*Design flows based on diverting entire drainage basin north of Avon Street to Wheeler Ditch.

Under existing conditions the interceptor sewer capacities are exceeded many times a year. It is not uncommon to see a street such as Springfield Avenue or East Peddie Street become completely awash with water six to twelve inches deep. The depth of flooding rarely exceeds one or two feet in the western area of the basin because the water readily flows down the streets toward the Newark Meadows. Frelinghuysen Avenue is located at the base of the hills along the boundary of the old meadows. Its elevations in the Peddie District range from 9 to 14 feet above mean sea level. The storm water ponds to a depth of three to four feet along Frelinghuysen between Earl and Hunter Streets and to a depth of two to three feet at the East Peddie Street Intersection. The elimination of flooding along Frelinghuysen Avenue is of the utmost importance.

The basis of the recommended minimum design flows in this watershed has been the flows derived from the Rational Method using a 5 year frequency storm as described in the Basis of Storm Water Design section of Chapter VI. A complete analysis was also made using the Newark Drainage Model Program to determine the relationship between the two approaches, which is also described in the Basis of Storm Water Design section.

Recommended Plan (Stage I)

The most critical area in this basin from a drainage standpoint is Frelinghuysen Avenue. It is a primary artery for north-south travel in the City, and it is flooded the most frequently. Several times a year it becomes impassable to autos and difficult even for large trucks. The roadway itself is also in need of major repair. The City is seeking additional funding for the reconstruction of the roadway and its drainage system, and the project has been given top priority by the City Council.

It is also essential that adequate outlet facilities be constructed for the proposed new storm drain along Frelinghuysen Avenue. The Peddie Ditch will, therefore, be realigned, widened and deepened, thereby significantly increasing its capacity. Plans are presently being prepared for this reconstruction and the estimated cost of this work is indicated in Table VII-3.

Recommended Plan (Stage II)

No Stage II construction is recommended in the Peddie District.

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Recommended Plan (Stage III)

During Stage III it is recommended that the new storm interceptor sewer be constructed along Avon Avenue, Wright Street and Avenue A. This interceptor will divert the northern half of the Peddie District to Wheeler Ditch and will minimize the improvements needed in the southern half of the watershed and greatly reduce the flooding along Frelinghuysen Avenue.

The details of the connections to the proposed Avon Avenue storm sewer may vary depending upon whether or not the sewer separation alternative is adopted. If separate sanitary sewers were provided, the storm sewers would be directly connected to the Avon Avenue relief line. However, if combined sewer overflow treatment is provided and sanitary waste continues to be carried in the existing large combined sewers, it is recommended that all dry weather flow be conveyed past the Avon Avenue sewer to discharge into the existing lines.

This has a twofold purpose: First, the increased flow to the south of Avon Avenue along Bergen Street and Badger Avenue will increase velocities and help minimize the settling of suspended material; and second, dry weather flows will be eliminated from the Avon Avenue sewer thereby eliminating the need for a diversion chamber to discharge sanitary flow to the South Side Interceptor sewer. The following discussion assumes that combined overflow treatment will be adopted for this basin.

Only three connections will be made to the Avon Avenue Storm Sewer Interceptor. The first will be at the intersection of Bergen Street and Avon Avenue. The existing combined sewer will be connected to the Interceptor by a regulating chamber which will pass dry weather flows along Bergen Street but divert the entire storm flow to the Interceptor. The proposed Interceptor is 96" diameter between Bergen Street and Badger Avenue.

A second diversion chamber will be constructed at the Badger Avenue intersection. A 144" diameter conduit will be required from this location to the Clinton Avenue intersection. Because of the topography, this section should be tunelled.

The third and final connection to the Interceptor will be at the intersection of Avon and Clinton Avenues. The elevation of this intersection is approximately 50 feet above mean sea level. The grade drops sharply from this point while traveling eastward along Wright Street, the proposed alignment.

At McCarter Highway, halfway to Wheeler Ditch, the elevation is approximately 10. There is a very minimal slope from McCarter Highway to Wheeler Ditch, which would normally require a conduit with an extremely large cross sectional area. However, if the conduit from Clinton Avenue to Wheeler Ditch is designed as a pressure conduit the average of the two gradients can be used, which will result in a tremendous cost savings. If this conduit is designed as a pressure conduit it will not be possible to connect local drainage downstream of Clinton Avenue into this conduit. Hence, a separate conduit will be required as described in the Adams and Wheeler District section of this Chapter.

Recommended Plan (Stage IV)

Upon the completion of the Avon Avenue Storm Sewer Interceptor, it is recommended that relief storm sewers be constructed in the remainder of the basin as shown on Exhibit 40. Each subdistrict should be improved as a unit starting with the one that is most inadequate. The outlet facilities should be improved first to avoid creating more severe flooding in downstream locations.

A summary of the stages of construction and estimated costs are presented in Table VII-3.

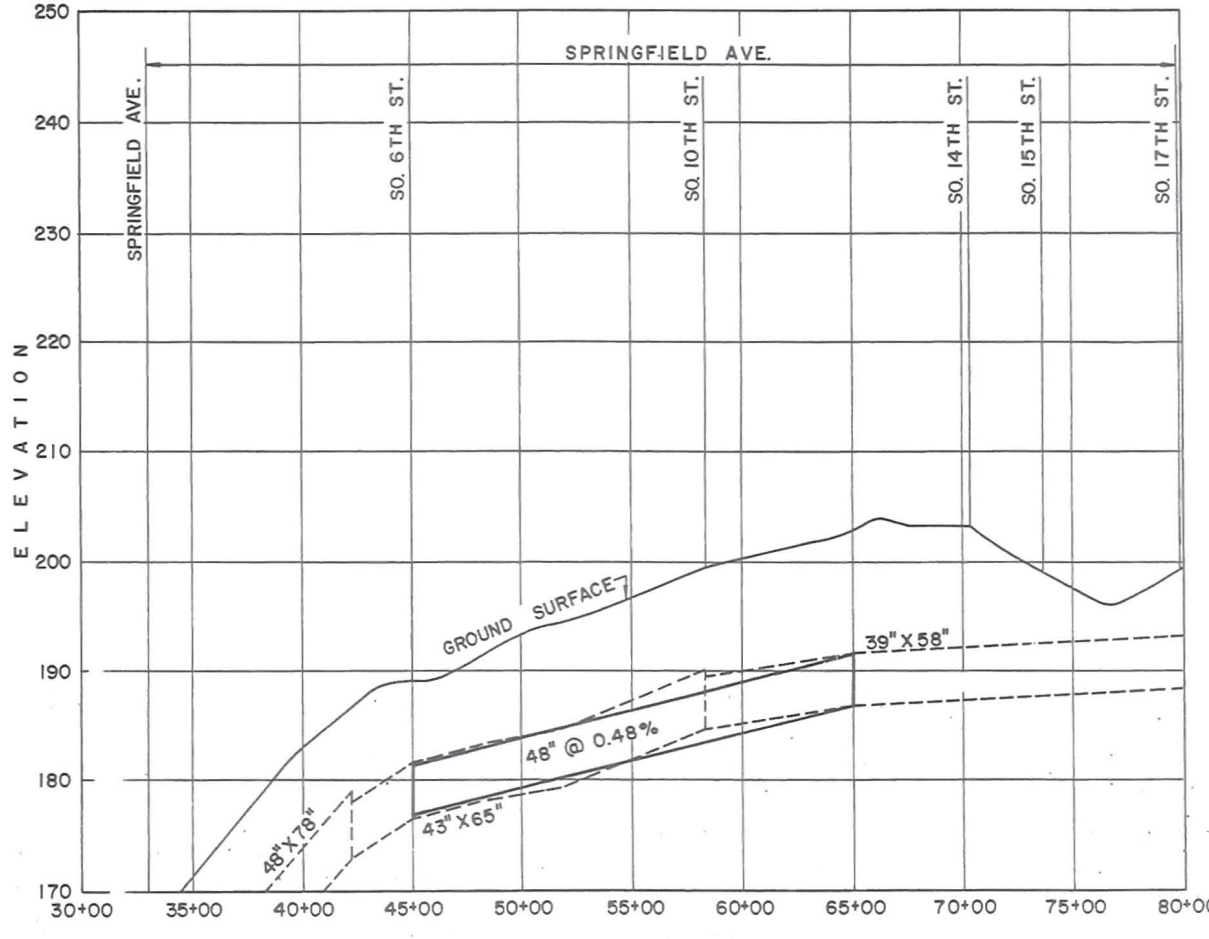
TABLE VII-3

PEDDIE DISTRICT
RECOMMENDED IMPROVEMENT PLAN

Location	Pipe Size in Inches	Estimated Cost
Stage I		
Frelinghuysen Ave.	42,48,54, 31 x 50 CMPA	$ 380,000
Peddie Ditch reconstruction		210,000
Subtotal		590,000
Stage II		
No construction		
Stage III		
Avon Ave. Diversion		
(Bergen to Clinton)	96 144	3,016,000
Wright St.	72 x 169 Box	1,024,000
Subtotal		4,080,000
Stage IV		
Springfield Ave.	48	280,000
16th Ave.	30,42,54	462,000
Clinton Ave.	24	11,000
Clinton Ave.	48	224,000
Hawthorne Ave.	24,42	207,000
Clinton Pl.	48	313,000
W. Ramyon St.	54	456,000
Seymour Ave.	54	103,000
Hawthorne-W. Peddie St.	60	126,000
Waverly Ave.	24	72,000
Bergen St.	72	746,000
Morris Ave.	36	86,000
Boyd St.	36	148,000
Avon Ave.	24	103,000
Subtotal		3,388,000
Total		$8,018,000

KLLC10583

PROFILE
EXHIBIT 42



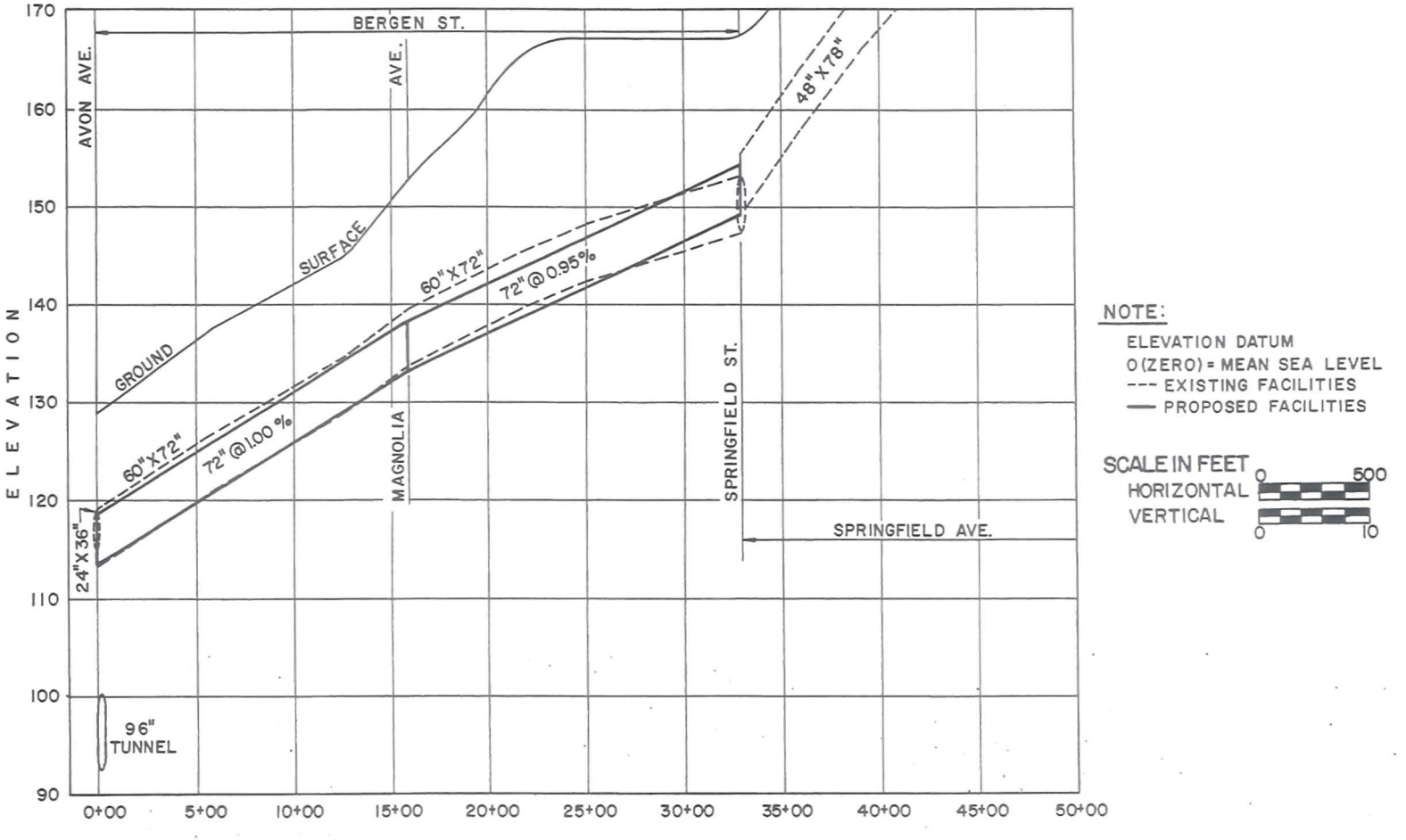
NOTE:
ELEVATION DATUM
0 (ZERO) = MEAN SEA LEVEL
--- EXISTING FACILITIES
— PROPOSED FACILITIES

SCALE IN FEET
HORIZONTAL 0 500
VERTICAL 0 10

SPRINGFIELD AVENUE

KLL010504

PROFILE
EXHIBIT 43



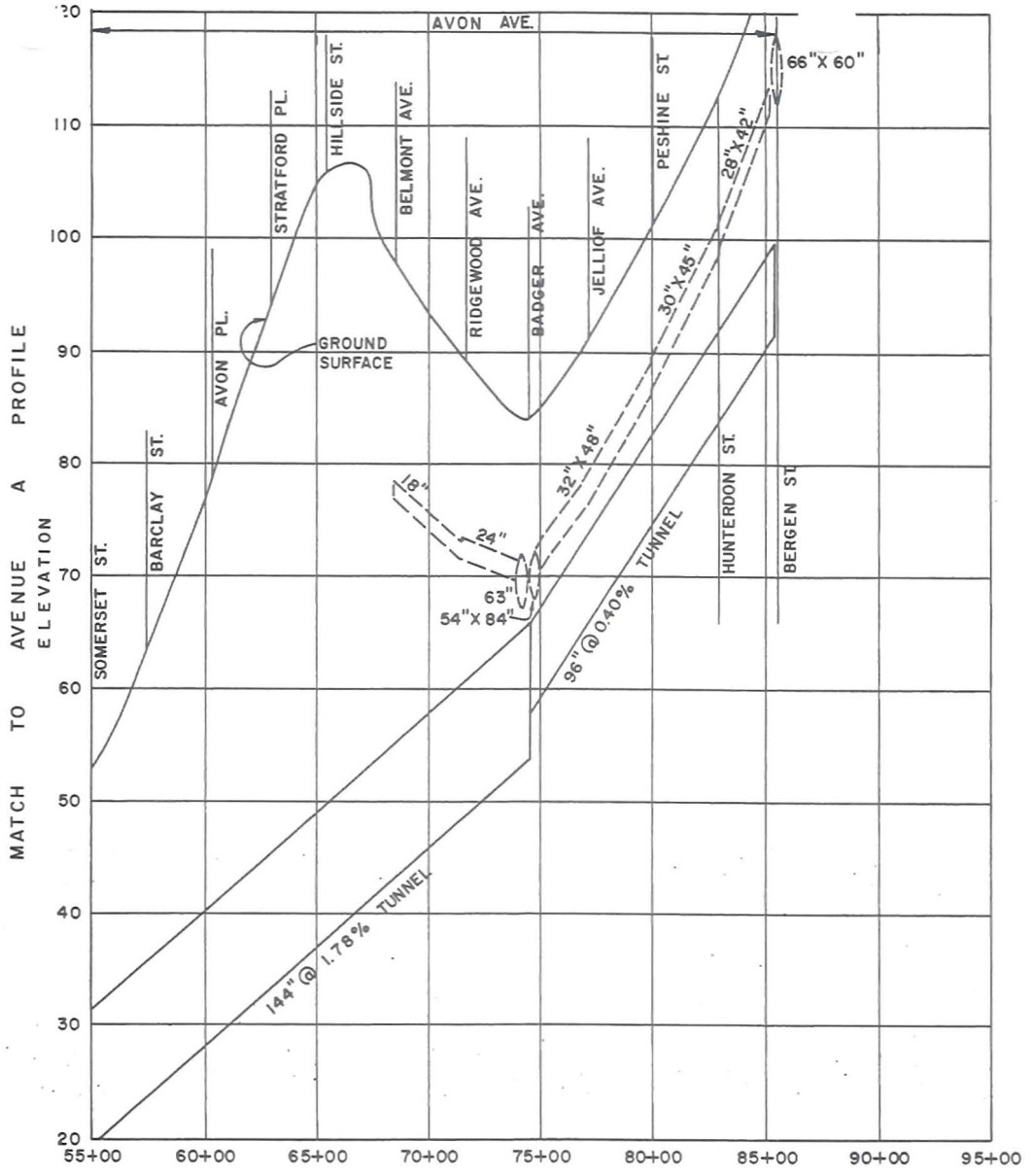
NOTE:

ELEVATION DATUM
0(ZERO) = MEAN SEA LEVEL
--- EXISTING FACILITIES
— PROPOSED FACILITIES

SCALE IN FEET
HORIZONTAL 0 500
VERTICAL 0 10

KLL010585

PROFILE
EXHIBIT 44



NOTE:

ELEVATION DATUM
0(ZERO) = MEAN SEA LEVEL
--- EXISTING FACILITIES
—— PROPOSED FACILITIES

SCALE IN FEET
HORIZONTAL 0 500
VERTICAL 0 10

KLLC10586

QUEEN AND WAVERLY DISTRICTS

Introduction

The Queen District contains 1,027 acres. The western area is mainly residential development sloping steeply toward the east and is served by separate sewer systems. The storm drainage in this area is conducted to the Township of Hillside, and the sanitary sewers drain to the combined sewer system in Meeker Avenue. The portion of the Queen District east of Weequahic Park and Elizabeth Avenue is quite flat. It is drained by combined sewers which outlet at the Queen Diversion Chamber at the foot of Westinghouse Street. A regulator gate passes the dry weather flow to the South Side Interceptor sewer, but discharges storm flow into the Queen Ditch. The Diversion Chamber outlet is presently completely obstructed and requires immediate relief to eliminate the frequent and severe flooding of Frelinghuysen Avenue and Meeker Avenue.

Meeker Avenue at the Route 22 underpass and Frelinghuysen Avenue 100 feet north of Noble Street are only 5.5 feet above mean sea level, and tide levels as high as 7.8 have been recorded in Newark Bay. The tide gates at the end of the Peripheral Ditch prevent the inundation of these low areas, however under conditions of even moderate rainfall and tide level, flooding occurs at these two low points. Extensive improvements of the drainage system in this district will be required to solve these problems.

The Waverly District lies between the Queen District and the southerly boundary of Newark and drains an area of approximately 350 acres. The land use in the watershed is primarily industrial, with some dense residential development. The combined sewer system discharges the dry weather flow into the southern end of the South Side Interceptor Sewer and bypasses the storm flow through a 96" outfall to the Peripheral Ditch. The only one roadway which crosses the Penn-Central Railroad within this district is McClellan Street. Prior to the construction of the tide gates on the Peripheral Ditch, frequent flooding occurred at the McClellan Street underpass which is approximately 6 feet above mean seal level. Presently there is a small storm water pump station located at this underpass, but the pumping capacity is not sufficient to keep the underpass from flooding during a heavy rainfall. The existing facilities are shown on Exhibit 45. Exhibits 46 and 47 show the location of the major water, gas, electric and telephone utilities throughout these districts.

Sewer Separation Alternative

The Queen District has a sewer system which is approximately 80% separated. The existing system does not discharge separated flows, since the sanitary laterals are connected to combined trunk sewers. The combined lines are found in the industrial areas bordering Frelinghuysen Avenue. If sewer separation could be effected on Elizabeth Avenue, Watson Avenue, Empire Street, Meeker Avenue and Frelinghuysen Avenue, the entire district would be completely separated.

The scheme of separation for the district is simple. The existing combined sewers in Meeker Avenue, Noble Street and a portion of Frelinghuysen Avenue will be converted to sanitary interceptors. A new sanitary sewer will be provided on Elizabeth Avenue where presently a combined system exists, and a separate system will be constructed on relocated Watson Avenue in conjunction with the construction of Route 78.

The existing sanitary sewer system west of Elizabeth Avenue will be connected to the existing 3.5' x 6' sewer in Meeker Avenue. All catch basin and roof leaders will be removed from this line so that it will carry only sanitary flow. The same procedure will be followed for the 48" diameter sewer in Noble Street and the 63" diameter sewer in Frelinghuysen Avenue from Noble Street to Victoria Street. The sewage will discharge into the sewer in Queen Street and be conveyed to the South Side Interceptor Sewer at the existing Queen Diversion Chamber. The overflow capabilities of the chamber will be eliminated to prevent accidental discharge of the sanitary waste into the ditch system.

The separate plan is shown on Exhibit 48.

A great difference will be noted between the unit cost of separation in this district and the Peddie District. This difference can be attributed to the fact that a great deal of the Queen District is already provided with separate lateral sewers, and the area requiring separation is industrial land with a relatively large street grid.

A cost estimate for the proposed separate sanitary sewer separation plan appears in Table VII-4.

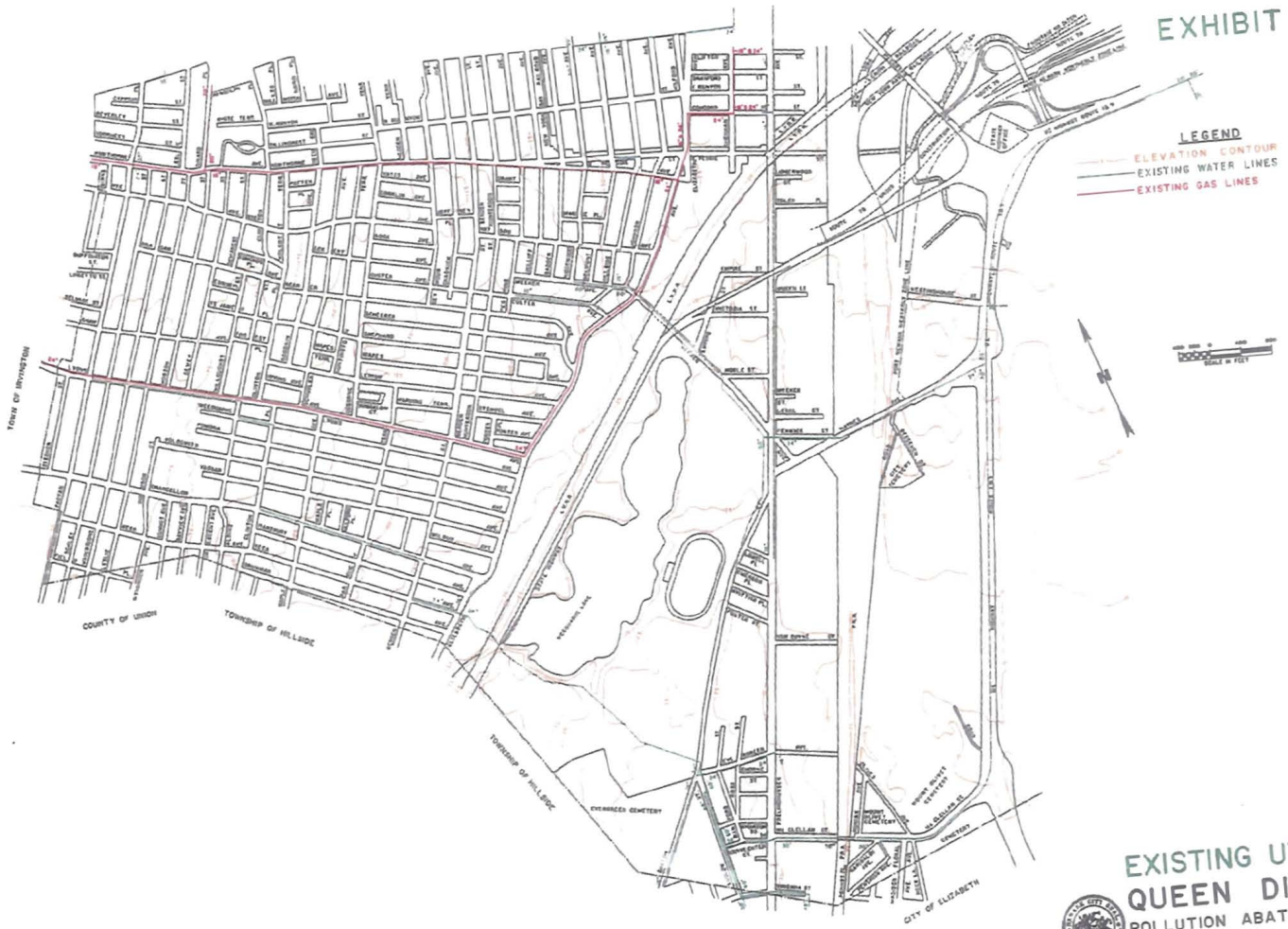
KLL010587

EXHIBIT 45

EXISTING SEWERS
QUEEN DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010588

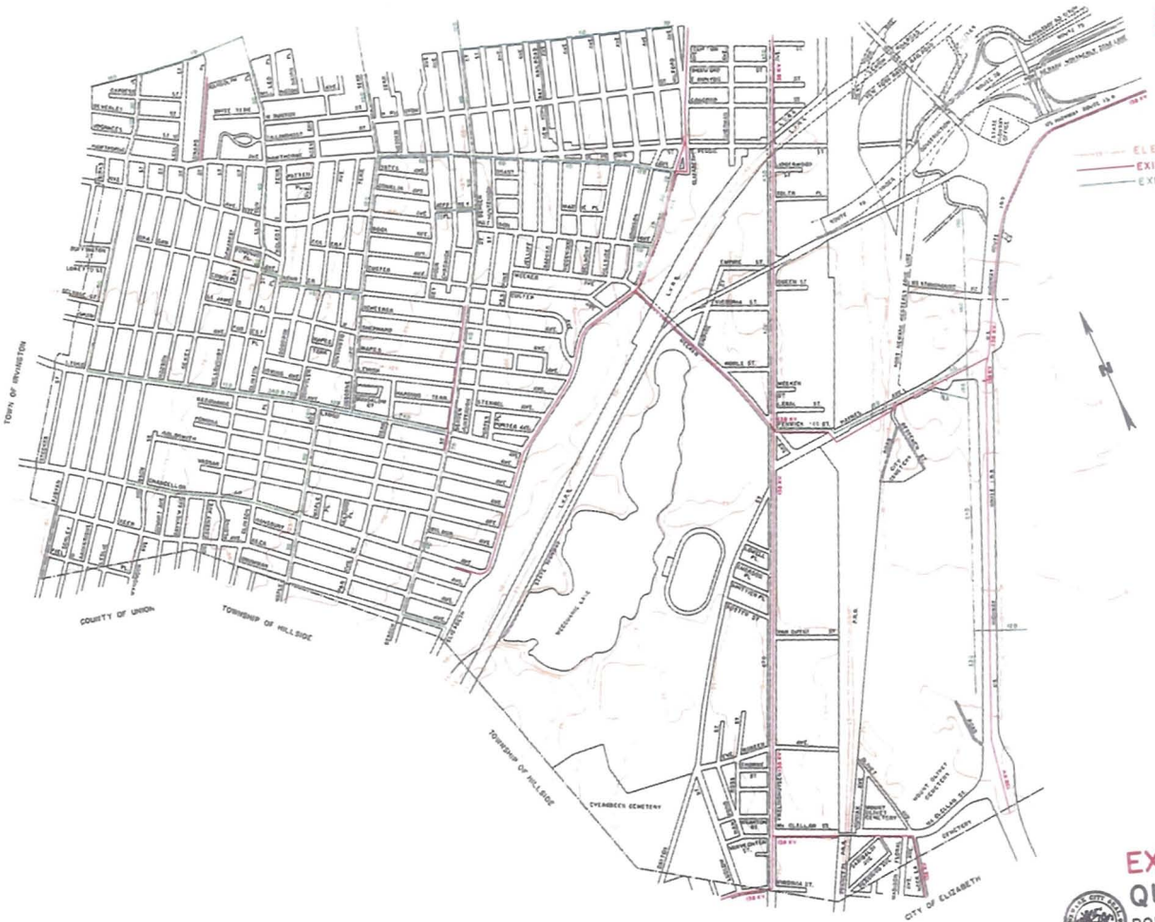
EXHIBIT 46



EXISTING UTILITIES
QUEEN DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010589

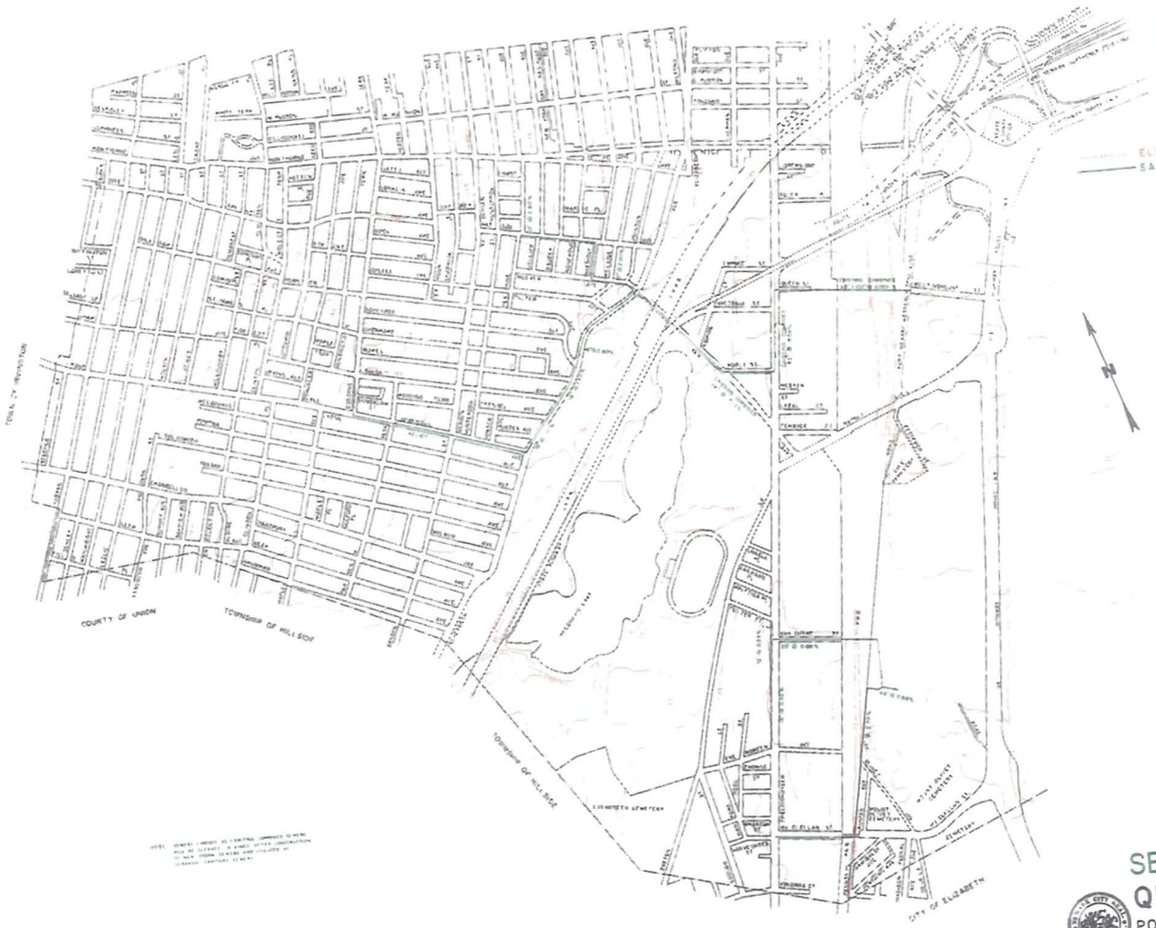
EXHIBIT 47



EXISTING UTILITIES
QUEEN DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010590

EXHIBIT 48



SEPARATION PLAN
QUEEN DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010591

TABLE VII-4

COST ESTIMATE
QUEEN DISTRICT SEWER SEPARATION

Location	Pipe Size In Inches	Estimated Cost
Osborne Terr.-Lyons Ave.	15	$ 208,000
Elizabeth Ave.	18	187,000
Watson Ave.-Belmont-Meeker Ave.	12	110,000
Meeker Ave.-Noble St. & Frelinghuysen Ave. (Convert Existing)		120,000
Subtotal		625,000
Lateral Sewer Cost - 60 acres x $14,000		840,000
Total		$1,465,000

The Waverly District is presently drained by four combined sewers which cross the Penn-Central Railroad at different locations. The northernmost sewer is located at Van Duyne Street, the second is in a right-of-way, 500 feet to the south of Van Duyne Street, the third is at Evergreen Avenue, and the southernmost is at McClellan Street.

The recommended sewer separation scheme will utilize the existing McClellan Street sewer for sanitary waste. The other three mains will be retained for the storm system. New 15" and 18" sanitary sewer lines will be provided on Frelinghuysen Avenue between Evergreen and Foster Streets. Another 30" diameter sewer will be provided on Van Duyne Street to convey the sewage from Frelinghuysen Avenue and Dayton Street to the diversion chamber at the South Side Interceptor Sewer. Existing lateral sewers on Foster Street, Dayton Street and Evergreen Avenue will be connected to the proposed sanitary sewer lines.

The projected average sewage flow for this district is 11.4 MGD, with a peak design flow of 25.2 MGD.

As in the case of the Queen District it is recommended that separation be effected for the Waverly District. The location of the Waverly Storm Sewer Outfall connection to the Peripheral Ditch is downstream of the proposed combined sewer overflow treatment facility. Thus, for this district there are only two options, separation, or construction of an individual treatment facility for this district. Because the required construction costs and operating costs of a second treatment facility would be excessive, it is recommended that separation be utilized in the Waverly District to eliminate the discharge of sewage into the Peripheral Ditch during storm flow periods.

It will be noted that the cost per acre of separation is higher than in the Queen District. This can primarily be attributed to the fact that the entire district is now served by combined sewers, so extensive system of lateral sewers will have to be installed.

The layout of the proposed sanitary sewers is shown on Exhibit 48 and the detailed cost estimate for these facilities follows on Table VII-5.

TABLE VII-5

COST ESTIMATE
WAVERLY DISTRICT SEWER SEPARATION

Location	Pipe Size In Inches	Estimated Cost
Frelinghuysen Ave.	15,18	$ 132,000
Van Duyne St.	30	89,000
R.R. Crossing	30	260,000
R.R. Easement	30	77,000
Budweiser Easement	48	50,000
Subtotal		608,000
Lateral Sewer Cost - 90 acres x $14,000		1,260,000
Total		$1,868,000

KLL010592

QUEEN DISTRICT STORM DRAINAGE

The major hydrologic feature of the Queen District is Weequahic Lake, with a surface of 77 acres. The 605 acre basin tributary to the lake generates a peak runoff of 600 c.f.s. Discharge to the city sewers is limited to a maximum 60 c.f.s. by a control chamber at the outlet of the lake. The lake, therefore, acts as a retention basin which reduces storm flows substantially in all downstream sewers.

In spite of this fact, as previously noted, extreme flooding occurs on a frequent basis at both the intersection of Frelinghuysen Avenue and Noble Street, and at the Meeker Avenue underpass at Route 22. Additional factors which have added to the severe flooding include a blockage of the main outlet sewer from the Queen Diversion Chamber, and severe siltation in the Queen Ditch. These obstructions back water up through the system to the Frelinghuysen Avenue and Meeker Avenue locations to approximately elevation 9.0 during a severe storm. The reconstruction of the Queen Ditch is essential to provide adequate drainage to this area.

Under the existing drainage pattern approximately 280 acres of this basin are effectively tributary to the Queen Street, Frelinghuysen Avenue intersection. The time of concentration to this point has been estimated to be approximately 30 minutes, which results in a design flow of 400 cubic feet per second. This flow has been derived from the Newark Drainage Model using a 5 year frequency rainfall. The capacity of the existing 60" x 102" culvert under the Penn-Central Railroad is only 150 cfs. Thus, even with the elimination of the severe obstructions in the outlet culvert and the Queen Ditch, the existing drainage system will still be extremely inadequate. As shown on Table VII-6, this is typical of the drainage facilities in this watershed. Because these existing facilities are so inadequate, relief sewers must be provided to achieve an effective storm drainage system.

TABLE VII-6

QUEEN DISTRICT
EXISTING SEWER CAPACITY Vs. DESIGN FLOW

Location	Size & Slope	Existing Capacity in cfs.	Minimum Design Flow cfs.
Elizabeth Ave. @ Custer Ave.	36" @ 4.66%	145	150
Elizabeth Ave. @ Meeker St	42" @ 0.04%	125	125
Meeker St. @ Empire St.	48" @ 0.13% & 42" x 72" @ 0.13%	90	180
Empire St. @ Frelinghuysen Ave.	48" x 72" @ 0.04%	70	70
Queen St.-Outlet	60" x 102" @ 0.005%	150	400

Recommended Plan (Stage 1)

The most critical drainage problem in this basin is the Queen Ditch. The obstruction of this ditch restricts the flow of the combined sewage during wet weather periods, and during extremely heavy storms combined sewage has ponded for as long as three days at the Noble Street-Frelinghuysen Avenue intersection, and at the Meeker Avenue underpass. This creates an extreme health hazard which must be eliminated at the earliest possible date. The construction drawings for this improvement have been prepared and construction is anticipated in the near future.

The City of Newark is presently seeking funding for the reconstruction of Frelinghuysen Avenue from Poinier Street to the City of Elizabeth line. The drainage improvements and sewer separation for Frelinghuysen Avenue that are shown on Exhibit 48 will be installed under this roadway reconstruction project.

The storm sewers proposed for Frelinghuysen Avenue will divert the flow from the existing Queen Street outlet to the new alignment indicated on Exhibit 49. The existing combined sewers in Frelinghuysen Avenue and those crossing the Penn-Central Railroad will be converted to sanitary sewers.

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The construction of major drainage facilities along Frelinghuysen Avenue outletting into Peddie Ditch will also be completed in the first stage of construction. As shown on Exhibit 49, major storm drains will be installed in the area extended from Dayton Street on the southerly boundary to Lidgerwood Street on the northerly boundary. A major outfall will be constructed adjacent to Route 22 across the Penn-Central Railroad Yard to Queen Ditch. In conjunction with this major drainage program, sanitary sewers will also be installed as necessary to separate the sewer systems in this area.

It is essential that the severe flooding problems in this area be solved at the earliest possible date. It is therefore recommended that the construction of these facilities begin as soon as funding is available.

Recommended Plan (Stage II)

The second stage of construction in this watershed will generally be the completion of the sewer separation and the elimination of the flooding problems along Meeker Avenue. The existing sewers in this area will be converted into sanitary sewers. New storm sewers will be constructed along Meeker Avenue, Empire Street and Victoria Street, and the existing 48" sewer in Noble Street will be converted into a sanitary sewer. All the work in this basin is extremely critical and should be completed as soon as possible.

A summary of these projects and their construction costs are shown on Table VII-7.

TABLE VII-7

QUEEN DISTRICT
RECOMMENDED IMPROVEMENT PLAN

STAGE I	
Queen Ditch	$ 400,000
Frelinghuysen Avenue	446,000
Queen District Outfall	2,917,000
Subtotal	$3,763,000
STAGE II	
Meeker Avenue Relief Sewer	$1,183,000
STAGE III & IV	
No Construction	
Total	$4,946,000

Recommended Plan (Stage III and IV)

All work in the Queen District should be completed during Stages I and III.

WAVERLY DISTRICT STORM DRAINAGE

Waverly District is located on the southerly boundary of the City of Newark. Route I-9 forms the easterly boundary and Dayton Street forms a westerly boundary. The north boundary is the common boundary between the Waverly and Queen Districts, located several hundred feet south of Haynes Avenue. In addition, a portion of the City of Elizabeth drains into this district from the area immediately east of the Penn-Central Railroad. The total tributary area is approximately 350 acres.

The general elevation of the developed portion of the watershed is higher than that of the Queen District. Along Frelinghuysen Avenue the elevations range from +10 to +30. Because of these higher elevations, the district experiences less flooding than the adjacent Queen District. The most frequent and severe flooding occurs at the McClellan Street underpass of the Penn-Central Railroad. The elevation of the roadway at this underpass is approximately 6 feet above mean sea level.

The existing drainage facilities in the district are combined sewers, as shown on Exhibit 45. These combined sewers are generally inadequate for the minimum recommended storm flows as indicated in Table VII-8. The capacity of the existing 96 inch outfall is approximately 230 c.f.s. compared to a design flow of 350 cubic feet per second. The existing sewer on Van Duyne Street is even more critical. It has a capacity of approximately 60 c.f.s. and a recommended design flow of 125 c.f.s. An equally severe condition exists at the McClellan Street underpass of the Penn-Central Railroad. A small storm water pumping station has been installed to evacuate the storm runoff. The capacity of this pump station is exceeded several times a year resulting in extreme and prolonged flooding.

Several means of solving the flooding problem at the McClellan Street underpass have been investigated. This underpass is an extremely narrow roadway which is inadequate for the relatively heavy traffic using it. One of the alternatives investigated was the elimination of the underpass and the construction of a roadway over the railroad. A conceptual design of a roadway overpass was prepared but it was found that the elevation of the

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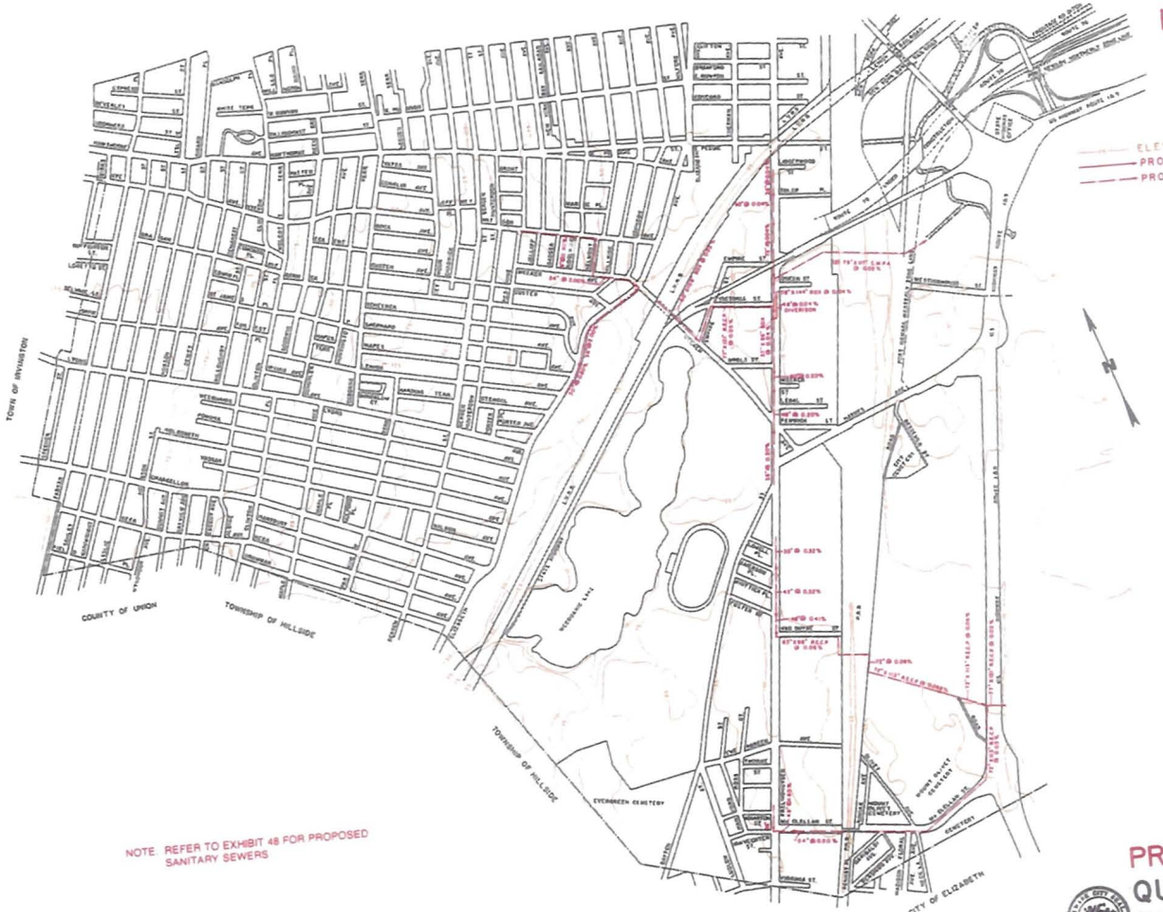
EXHIBIT 49

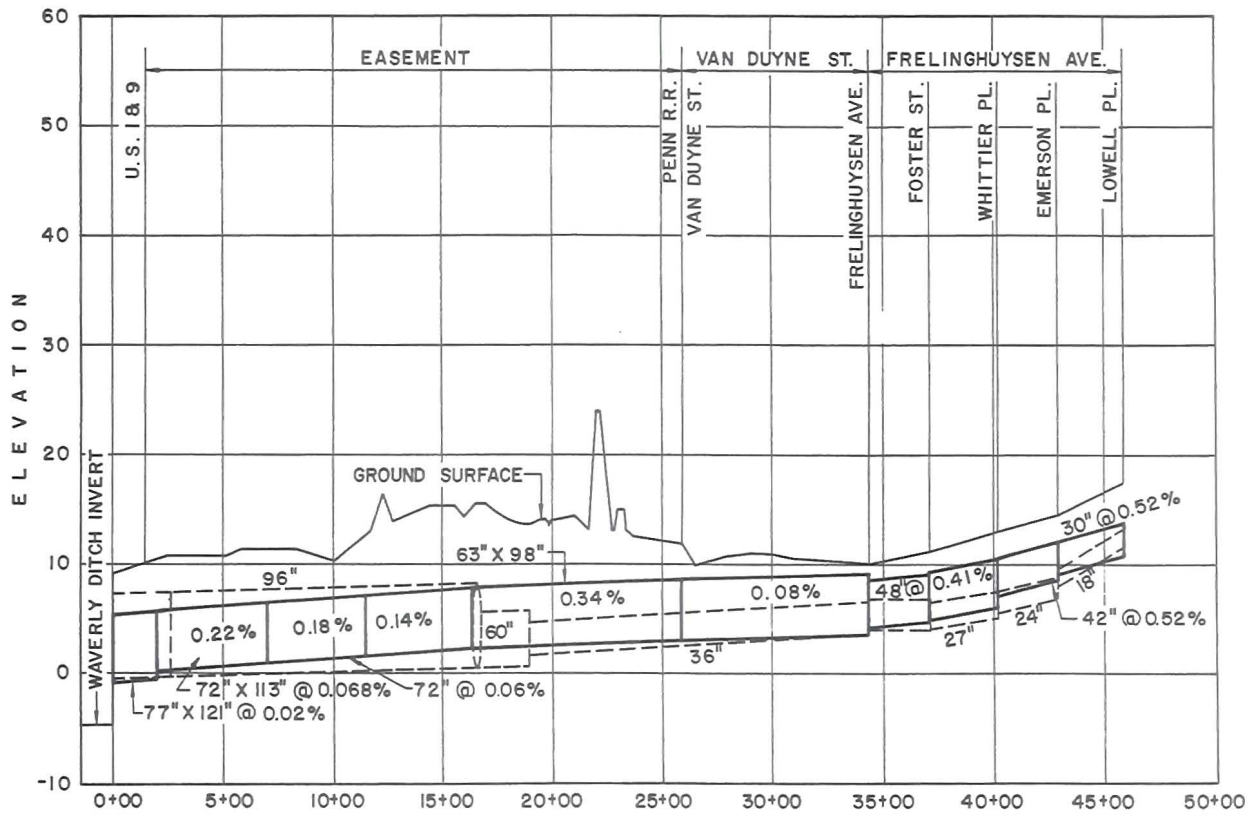


NOTE: REFER TO EXHIBIT 48 FOR PROPOSED SANITARY SEWERS

PROPOSED SEWERS
QUEEN DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010595

PROFILE
EXHIBIT 50

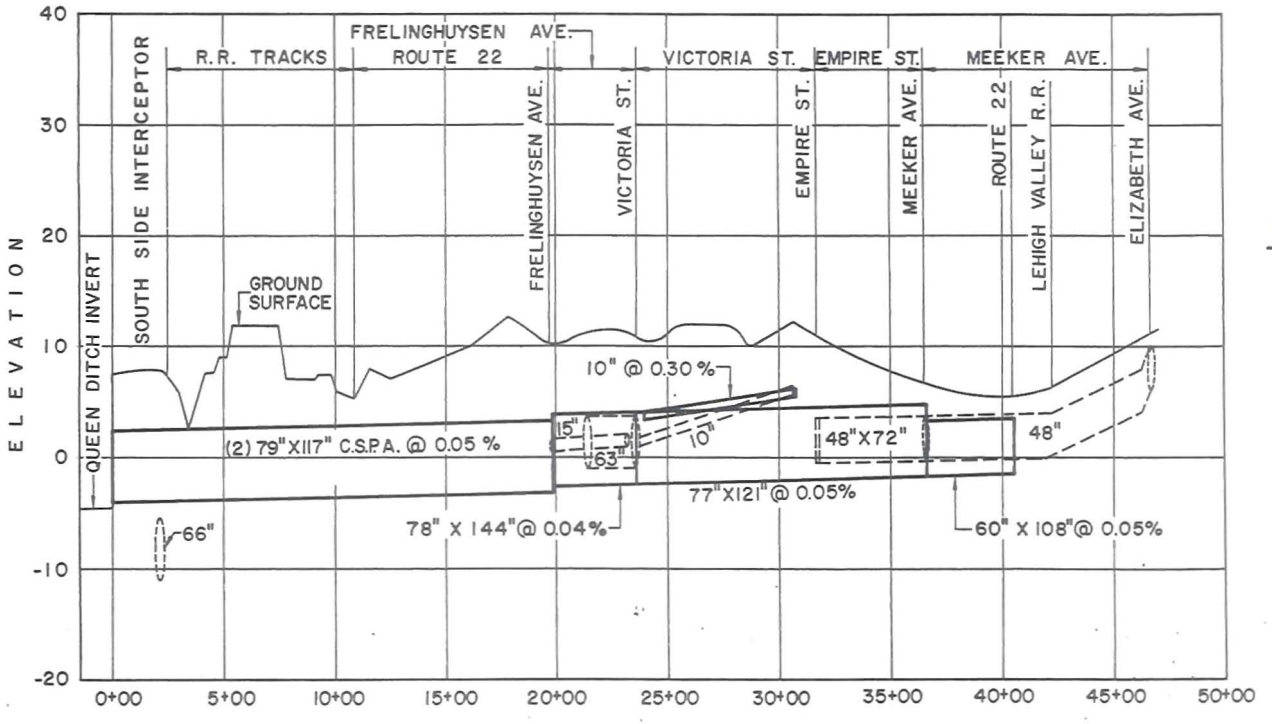


NOTE:
ELEVATION DATUM
0 (ZERO) = MEAN SEA LEVEL
--- EXISTING FACILITIES
— PROPOSED FACILITIES

VAN DUYNE ST.

KLL010596

PROFILE
EXHIBIT 51

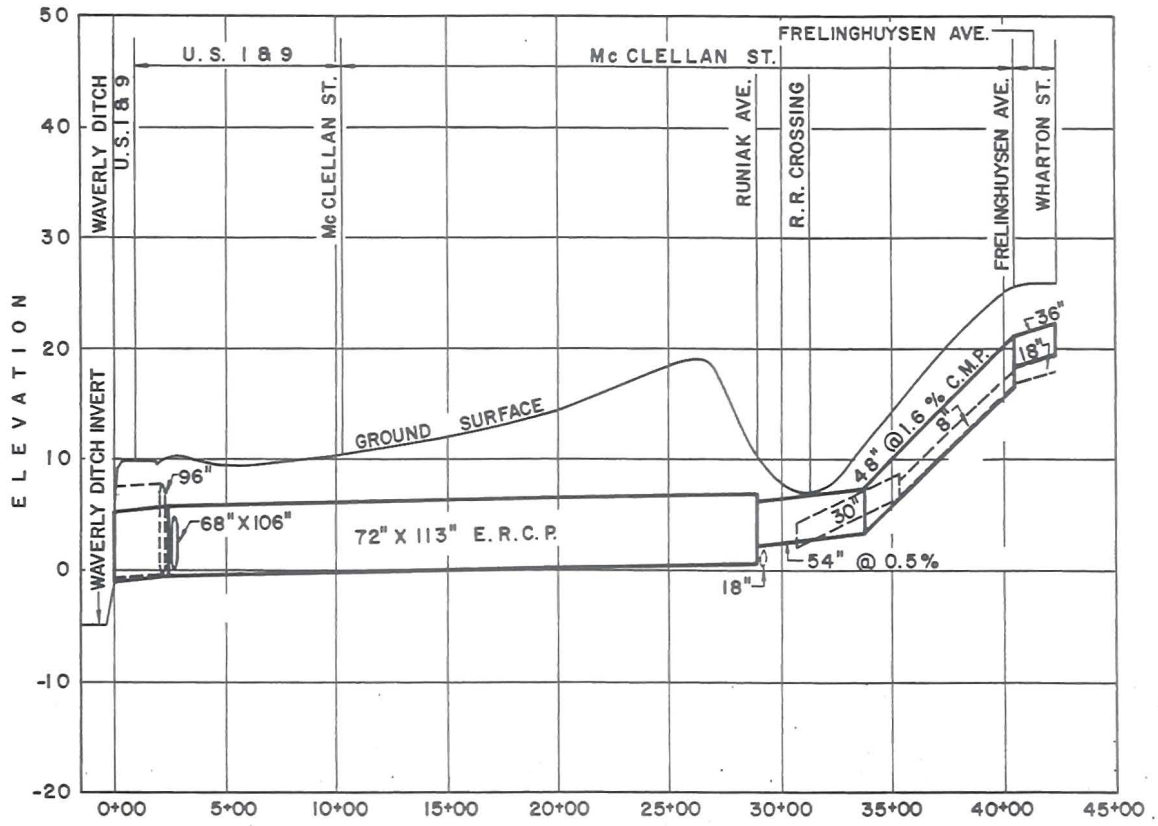


NOTE:
ELEVATION DATUM
0(ZERO) = MEAN SEA LEVEL
--- EXISTING FACILITIES
— PROPOSED FACILITIES

QUEEN OUTFALL

KLL010597

PROFILE
EXHIBIT 52



NOTE:

ELEVATION DATUM
0(ZERO) = MEAN SEA LEVEL
--- EXISTING FACILITIES
— PROPOSED FACILITIES

Mc CLELLAN ST. STORM OUTFALL SEWER

KLL010598

TABLE VII-8

WAVERLY DISTRICT
EXISTING SEWER CAPACITY Vs. DESIGN FLOW

Location	Size & Slope	Existing Capacity	Minimum Design Flow
Across R R (Fr. Evergreen St.)	24" x 72" @ 0 20%	60	100
Along R.R. (Fr. McClellan St.)	36" x 54" @ 0 05%	22	120
Across R.R. (Fr. Driveway)	60" x 84" @ 0.03%	100	90
Van Duyne St.	36" @ 1.0%	60	125
Along R.R. (North)	60" @ 0 27%	115	150
Budweiser Easement	96" @ 0.068%	230	350
Culvert Under Rt. 1-9	96" @ 0.068%	200	450

railroad would force the roadway to approximately elevation 30. This high elevation would require long, costly transition ramps from the existing roadways. The construction of a wider roadway underpass would solve the traffic problem but would not solve the flooding problem resulting from the low elevation of the roadway.

The present pumping station discharges the combined sewage into a 36" x 54" culvert which flows northerly to the South Side Interceptor Sewer at the rear of the Anheuser-Busch property. The proposed storm outfall would pick up laterals at the intersection of McClellan Street and Frelinghuysen Avenue, and would then head in an easterly direction in the northern shoulder of McClellan Street. The roadway in this area is already very heavily concentrated with utilities, and a suitable alignment is not available through the underpass. The storm drain will, therefore, be tunnelled under the railroad. The alignment will then continue along McClellan Street to Route I-9, and head northerly in the shoulder of the highway to the previously constructred corssing of Route 1-9.

A second location in the Waverly District that experiences relatively frequent and severe flooding is a low point on Frelinghuysen Avenue in front of Aristocrat Leather Company. Flooding at this location has reached a depth of one to two feet and completely ponds over the roadway making travel very hazardous. The existing combined sewer draining this area has a capacity of approximately 100 c.f.s. and a proposed design flow of 90 c.f.s. However, this design flow is based on the assumption that adequate drainage will be provided in upstream areas and that some runoff will be diverted through other alignments. Presently a great majority of the Waverly District drains through this low point and is dependent upon the single storm drain for an outlet.

Recommended Plan (Stage I and II)

To provide an adequate outlet for the proposed storm sewers on Frelinghuysen Avenue, relief outfalls would be constructed on McClellan Street and on the easement within the Budweiser property. The construction of the McClellan Street facilities will be delayed until Stage II so that McClellan Street can be used as a detour during the Stage I reconstruction of Frelinghuysen Avenue. Table VII-9 shows the proposed stage construction of these facilities and the associated cost estimates.

TABLE VII-9

WAVERLY DISTRICT
RECOMMENDED IMPROVEMENT PLAN

	Pipe Size in Inches	
STAGE I		
Van Duyne St. Outfall	30,42,48,72 63 x 98 RECP 72 x 113 RECP 72 x 121 RECP	$1,170,000
Subtotal		$1,170,000
STAGE II		
McClellan St. Outfall	36,54 72 x 113 RECP	$1,600,000
Subtotal		$1,600,000
STAGE III & IV No Construction		
Total		$2,770,000

NOTE: Sewer separation also recommended refers to Table VII-5 for cost estimate.

Recommended Plan (Stage III and IV)

All work in the Waverly District should be completed during Stage I and Stage II

KLL010599

ADAMS AND WHEELER DISTRICTS

Introduction

The Adams and Wheeler Districts are located on the northerly side of the Newark Meadows. As shown on Exhibit 53, the Adams District is generally bounded by Route I-9 on the south, Avenue B, Mulberry Street and McCarter Highway on the west, Lafayette Street on the north and Pulaski Street on the east. This area includes a mixture of dense residential and industrial use. Residential development is generally to the north of South Street, and very intense industrial use presently exists between the New York Bay Railroad and South Street. To the south of the New York Bay Railroad is a relatively large marshland area that is presently under development. Within the last few years a Holiday Inn has been constructed on the Frontage Road, a service road to the new Interstate Highway 78.

The Wheeler District is to the west of the Adams District. The vast majority of the District is presently dense residential use with a minor portion of the area along the New York Bay Railroad being industrial use. The Wheeler District borders the Peddie District, and the dry weather sanitary flow from approximately 280 acres of the Peddie District is diverted to the Wheeler District.

As shown on Exhibit 53, the existing sewer systems in both the Adams and Wheeler Districts are primarily combined sewers. The South Side Interceptor Sewer traverses the meadowland area of the Adams District along the New York Bay Railroad. However, neither the Wheeler District nor Adams District are connected to the South Side Interceptor. The sanitary wastes for these two districts are connected into the sanitary interceptor sewer in South Street. Prior to the construction of the South Side Interceptor Sewer the South Street Sewer carried the waste from the Peddie, the Wheeler and Adams Districts to the Passaic Valley Interceptor Sewer on Bay Avenue. A small portion of the Peddie District also discharges its dry weather flow into the South Street Sewer at the intersection of Earl Street and Frelinghuysen Avenue through a 24" drop connection from the storm sewer. During dry weather flow the total flow enters the sanitary sewer below; during wet weather periods the flow continues across Frelinghuysen Avenue into the Pennsylvania Avenue storm sewer.

The South Street Sewer leaves Frelinghuysen Avenue at Vanderpool Street and flows in an easterly direction, then along McCarter Highway to the intersection of Emmett Street and McCarter Highway. At that intersection a major interconnection is made which diverts the dry weather flow from the Wheeler District Interceptor into the South Street Sewer. During wet weather periods the combined sewage flow crosses the sanitary interceptor and flows into the Avenue A storm outfall.

The South Street Sewer then flows easterly along Emmett Street to Avenue C and northerly along Avenue C and Dawson Street to the intersection of Dawson Street and South Street. At that intersection dry weather flow is again diverted from the combined sewer system into the South Street Sewer. The South Street Sewer then flows in an easterly direction to Jefferson Avenue where, again, dry weather flow enters the South Street Sewer. Wet weather flows across South Street along Jefferson to Thomas Street, then flows into the Adams Street combined sewer outlet. The South Street Sewer then flows in an easterly direction to Bay Avenue where it connects to the Passaic Valley Sewerage Commissioners Interceptor Sewer.

There are a few separate sanitary sewers, in the Adams and Wheeler Districts, generally in the industrial areas bordering New York Bay Railroad. However, the majority of this district is served by combined sewers. Two major combined sewer outfalls convey the runoff from these districts into the ditch system which flows around Newark Airport.

The Wheeler District combined sewer outlet is located at Avenue A, and discharges into the Wheeler Ditch. A second major outfall on Adams Street crosses the railroad and discharges into the Frontage Road Ditch as indicated on Exhibit 53. Both of these storm outfalls are extremely inadequate resulting in frequent and severe flooding within these districts. The most severely flooded areas are the industrial areas immediately to the north of the Newark Bay Railroad. At relatively frequent intervals the area around Vanderpool Street and Avenue C, is one to two feet under water, as is South Street from Van Buren Street to Jefferson Street. There are also several other low points within the southern portion of these districts which experience frequent flooding.

Exhibits 54 and 55 present the location of the major water, gas, electric and telephone utilities throughout these districts.

KLL010600

EXHIBIT 53

LEGEND

- ELEVATION CONTOUR
- DRAINAGE LIMIT
- EXISTING COMBINED SEWERS
- EXISTING SANITARY SEWERS
- EXISTING STORM SEWERS
- DRAINAGE DITCHES
- DIVERSION CHAMBER

400 200 0 400 800
SCALE IN FEET

EXISTING SEWERS
ADAMS DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010601

EXHIBIT 54

LEGEND

ELEVATION CONTOUR

EXISTING WATER LINES

EXISTING GAS LINES

SCALE IN FEET

EXISTING UTILITIES
ADAMS DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010602

EXHIBIT 55

LEGEND

ELEVATION CONTOUR

EXISTING ELECTRIC LINES

EXISTING TELEPHONE LINES

SCALE IN FEET

EXISTING UTILITIES
ADAMS DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010603

Sewer Separation Plan

The Adams and Wheeler Districts and the easternmost portion of the Peddie District are presently served by the South Street Sewer. Analysis of this major collector sewer considering both present and possible future land uses indicates that the South Street Collector does have and will continue to have adequate capacities to convey the sanitary wastes from these districts to the Passaic Valley Sewerage Commissioners Interceptor Sewer on Bay Avenue. The South Street Sewer will, therefore, be utilized as the basis of the sanitary sewer separation alternative. As shown on Exhibit 56, new sanitary sewer laterals will have to be constructed generally paralleling the existing combined sewer system. The combined sewers will in general be converted to storm sewers and the sanitary system will pick up the individual house connections and the existing smaller laterals on the side streets. Five major sanitary collector systems will be installed; the first will be in the Peddie District serving the area of Sherman Avenue, Somerset Street and Broome Street. The second collector system will service the Murray Street area. The third will service the area of South Street north of Dawson Street. The fourth will service the McWhorter Street area and the fifth will service the Jefferson Street area.

Each of these collector systems will also have an associated lateral sewer system. It is intended to utilize most of the small existing combined sewers as sanitary laterals. In addition, an extensive new sanitary sewer system will have to be constructed.

The estimated total sanitary flow developed by these districts is an average daily flow of 15.4 mgd and a peak design flow of approximately 31 mgd.

As shown on Table VII-10, sewer separation costs will be very large for these two districts.

It is, therefore, recommended that sewer separation not be pursued, but that combined sewage treatment be utilized as discussed in Chapter VIII of this report.

Adams and Wheeler Districts Storm Drainage

The storm flow from the Adams and Wheeler Districts discharges into the northwest corner of the Newark Meadows. Under existing conditions the storm drainage systems for the districts are divided along Avenue B, Mulberry Street and McCarter Highway. Adams District drains the southern portion of the Ironbound Section of the City which has extremely low elevations. There are several intersections along Adams Street, South Street and Thomas Street which are only 6 feet above mean sea level. The highest point in the Adams District is approximately 30 feet above mean sea level.

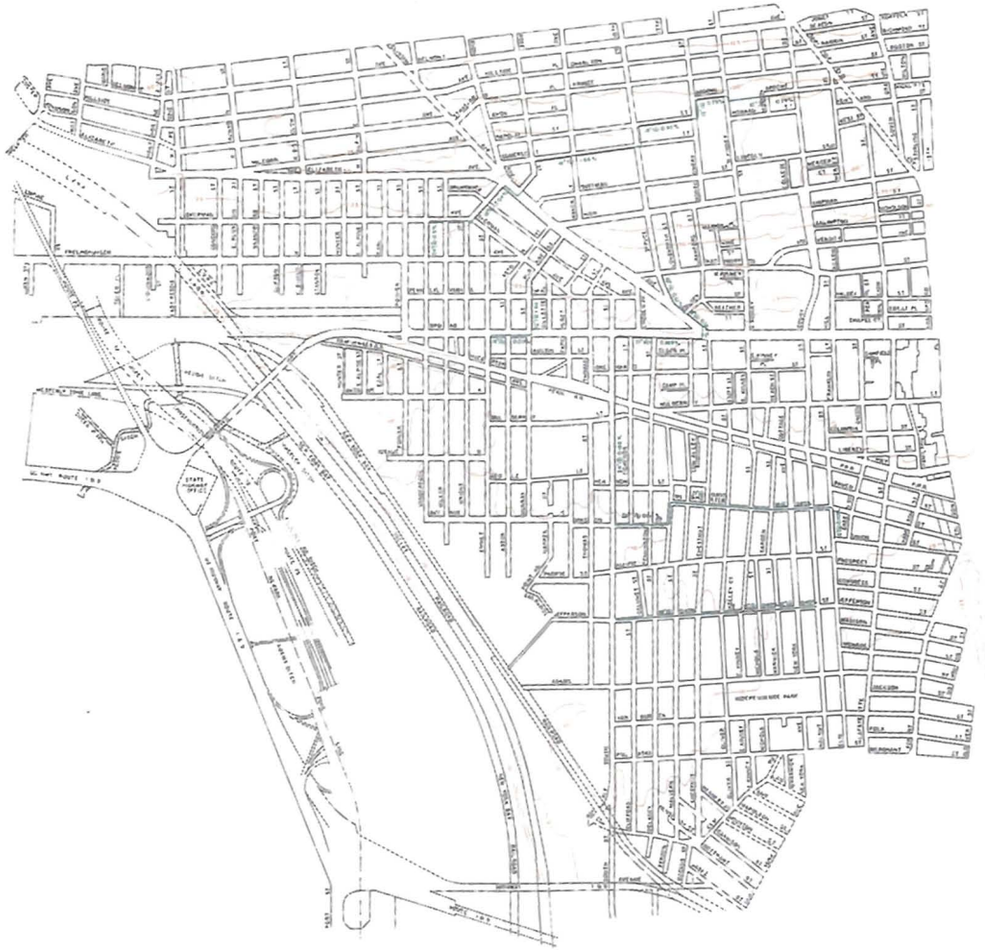
TABLE VII-10

COST ESTIMATE
ADAMS AND WHEELER DISTRICTS SEWER SEPARATION

Location	Pipe Size In Inches	Estimated Cost
Jefferson St.	12,15,18	$ 261,000
Elm St.- McWhorter St, Johnson St.-Dawson St.	18,21	295,000
Spruce St.-Lincoln Pk. Broad St.-South St.	10,18,-21,24	409,000
Murray St.-Broad St. Emmett St.	12,18	178,000
Broome St.-Barclay St.-Somerset, Wright-Sherman Ave.-Vanderpool St.	12,18,24	585,000
Subtotal		$1,728,000
Lateral Sewer 600 acres x $20,000		12,000,000
Total		$13,728,000

KLL010604

EXHIBIT 56



LEGEND

ELEVATION CONTOUR

SANITARY SEWERS

N

SCALE IN FEET

SEPARATION PLAN
ADAMS DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010605

The Wheeler District drains an area of approximately 440 acres. The portion of the district east of McCarter Highway is quite low, having elevations ranging from only 3.5 feet above mean sea level at the intersection of Avenue C, and Vanderpool Street to a high of about 15 feet at the intersection of McCarter Highway and Tichenor Street. West of McCarter Highway the elevation rises rapidly to a maximum of 125 feet along Belmont Avenue. Frequent flooding occurs in the southern portion of both the Adams and Wheeler Districts. Avenue C, South Street, Thomas Street and Delancey Street all have several locations that flood several times a year. The flooding is caused by a combination of inadequate interceptor sewers and a backwater condition resulting from restrictions in the outlet sewers and ditches. Since this is a heavily industrialized area, such flooding has an economical effect on industrial operations.

Table VII-11 presents the capacity of the existing sewers and the recommended design flows. Since the design flows are based on the proposed diversion of half of the Peddie District to the Wheeler outfall, the Table does not provide a valid representation of the existing systems. As an example, the runoff from approximately 280 acres has been diverted away from the Adams Street outlet. Without the diversion, the design flow at this location would be approximately 450 c.f.s. rather than 150 c.f.s. indicated.

Recommended Plan (Stage I)

The most pressing improvements required in the Adams and Wheeler Districts are the reconstruction of the Wheeler Ditch and the installation of a 58" x 91" R.E.C.P. at the Adams outfall. The installations of the 58" x 91" conduit would increase the capacity of the outfall to approximately 120 c.f.s. which is consistant with the capacity of the two upstream 4'x6' box culverts.

It was noted in the Interim Report that the Adams outlet had been sealed off by deposits of fatty wastes illegally discharged into the sewer by a tannery. Recently, a sanitary sewer has been installed to serve this area and the deposits have been removed. As a result, the outfall now functions at its full hydraulic capacity of approximately 60 c.f.s.

The Wheeler District has a grossly inadequate outlet which is heavily silted and overgrown. In addition, the Wheeler District is severely constricted by a single 36" diameter corrugated metal pipe installed under an access drive

TABLE VII-11

ADAMS AND WHEELER DISTRICTS
EXISTING SEWER CAPACITY Vs. DESIGN FLOW

Location	Size & Slope	Existing Capacity	Minimum Design Flow
Hermon @ Chestnut	39" x 72" @ 0.032%	100	100
Dawson @ South St.	42" x 48" @ 0.16%	45	175
Jefferson St. @ South St.	48" @ 0.08%	40	150
Adams St. @ South St.	42" x 72" 0.08%	70	120
Thomas St. @ Adams St.	48" x 96" @ 0.04%	100	50
Adams St. - Outlet	(2) 48" @ 0.02%	60	150
Clinton Ave. @ Broad St.	40" x 60" @ 0.15%	55	65
Murrary St. @ Broad St.	30" x 45" @ 1.91%	140	130
Gillette Pl. @ Broad St.	48" @ 0.35%	84	80
Emmett St. @ McCarter Hwy.	48" x 72" @ 0.20%	110	300
Avenue A - Outlet*	60" x 96" @ 0.04%	135	1800*

*Includes diversion of 790 acres from Peddie District and 280 acres from Adams District.

which crosses the Ditch. Approximately 400 acres are tributary to this location, which would normally require an unrestricted channel approximately 15 feet wide.

This 36" pipe and other major restrictions must be removed from the channel immediately to provide even an absolute minimum outfall capacity. Plans are presently being prepared for the reconstruction of this ditch, but the removal of the 36" pipe should not be delayed until the plans are completed. Immediate action should be taken.

The cost estimates for improving the Adams outfall and reconstruction of the Wheeler Ditch are included on Table VII-12.

KLL010606

Recommended Plan (Stage II)

Extensive construction has been recommended during Stage II. The most difficult work will be the construction of the outfall storm sewer across the railroad to Wheeler Ditch. The crossing consists of four cells 6 feet high by 14 feet wide, as shown on Exhibit 57.

Structural considerations may dictate the use of a different size cell, but a total cross sectional area of about 300 square feet must be provided. Such a structure will be extremely expensive and will require major coordination with the railroad.

The diversion of the Adams District along Thomas Street and the connection to the railroad crossing will also be implemented during Stage II. This major storm drain will relieve the inadequate outlet at Adams Street and intercept the storm drainage from Jefferson, Pacific and McWhorter Streets. Under the recommended plan of storm water overflow treatment, the local drainage facilities will be connected to this proposed storm drain by regulator chambers which will divert dry weather flow into the existing South Street Sewer and allow only wet weather flow to enter the new conduit. The required new sanitary sewers will be directly connected to the South Street Sewer so only storm water will enter the outfall. The cost estimate for these facilities on Exhibit 58 is presented in Table VII-12.

Recommended Plan (Stage III)

Extensive improvements are also recommended for construction during Stage III. The proposed diversion facilities from Peddie District will be constructed during this stage. As described earlier in this chapter, the northern half of the Peddie District will be diverted along Avon Avenue, Wright Street and Avenue A to the Wheeler Ditch. The reach extending from Clinton Avenue to Wheeler Ditch will be designed to flow as a pressure conduit to minimize its size. The pressure flow will prevent the discharge of local drainage into the diversion sewer, so a separate cell will have to be provided as shown on Exhibit 59. Local drainage will be collected in the 72" x 120" cell between McCarter Highway and the railroad, and discharged into Wheeler Ditch. The pressure flow will also require special construction details such as pressure tight manholes, and pressure tight construction joints. These provisions are justified by the fact that the size of the conduit would more than double if a gravity system were provided between McCarter Highway and Wheeler Ditch.

The remainder of the Stage III work will include the construction of major lateral sewer system along McWhorter, Jefferson and Adams Streets as shown on Exhibit 60. These lateral storm sewers are necessary to provide adequate drainage to the low area north of Thomas Street in the Adams District.

The cost estimate for these facilities is shown in Table VII-12.

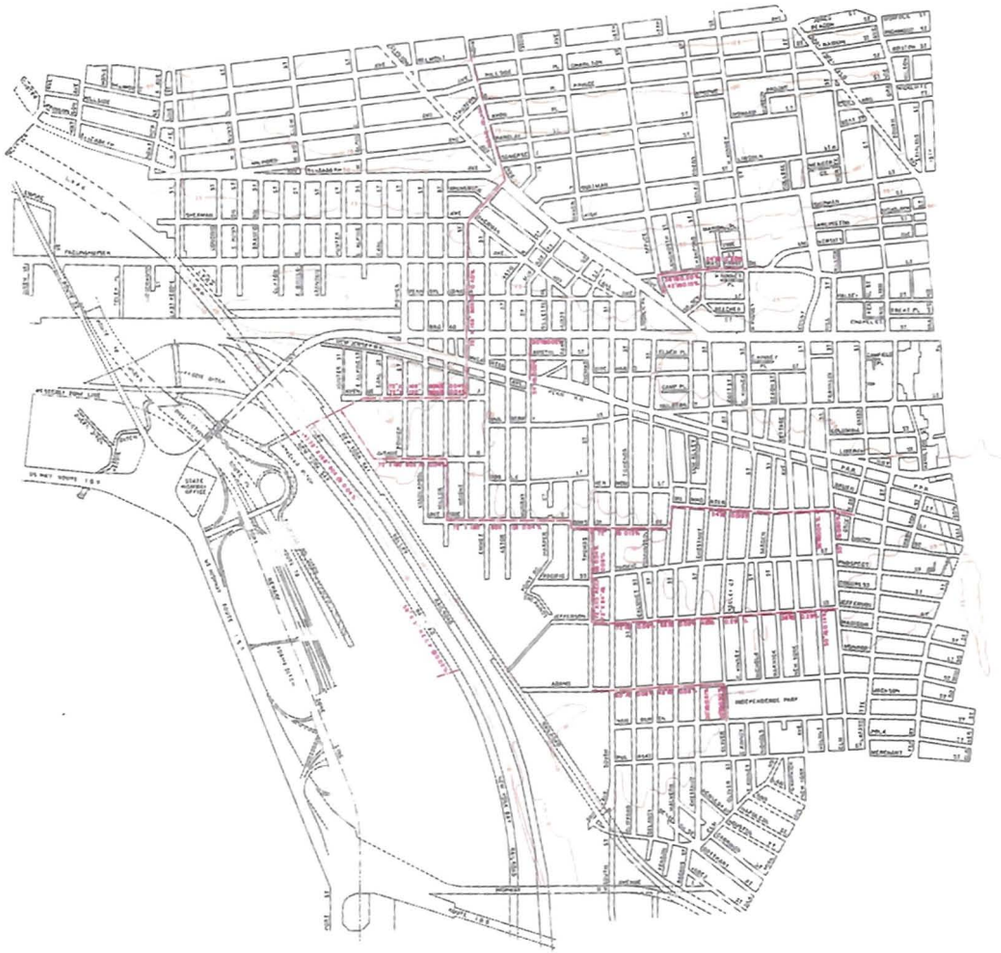
TABLE VII-12

ADAMS AND WHEELER DISTRICTS
RECOMMENDED IMPROVEMENT PLAN COST ESTIMATE

Location	Pipe Sizes In Inches	Estimated Cost
Stage I		
Adams Outlet	RECP 58 x 91	$ 70,000
Wheeler Ditch Reconstruction		350,000
Subtotal		420,000
Stage II		
Railroad Crossing	4 @ 72 x 168	2,206,000
Thomas St.	RECP 72 x 113	377,000
Avenue C and Miller St.	72 x 180	1,923,000
Avenue B and RR Easement	72 x 180	1,421,000
Subtotal		5,927,000
Stage III		
Washington and Spruce Sts.	24,36,42	155,000
Jefferson St.	30,36,48,66,72 72 x 84	466,000
Oliver and Adams Sts.	30,48,60	247,000
McWhorter and Dawson Sts.	30,36,54,72, 72 x 180	918,000
W. Wright St.	72 x 120 & 72 x 168	1,479,000
Avenue A	72 x 168 & 72 x 120	2,353,000
Subtotal		5,618,000
Stage IV		
Murray St.	30,54	58,000
Total		$12,023,000

KLLC10607

EXHIBIT 57



LEGEND

ELEVATION CONTOUR

PROPOSED STORM SEWERS

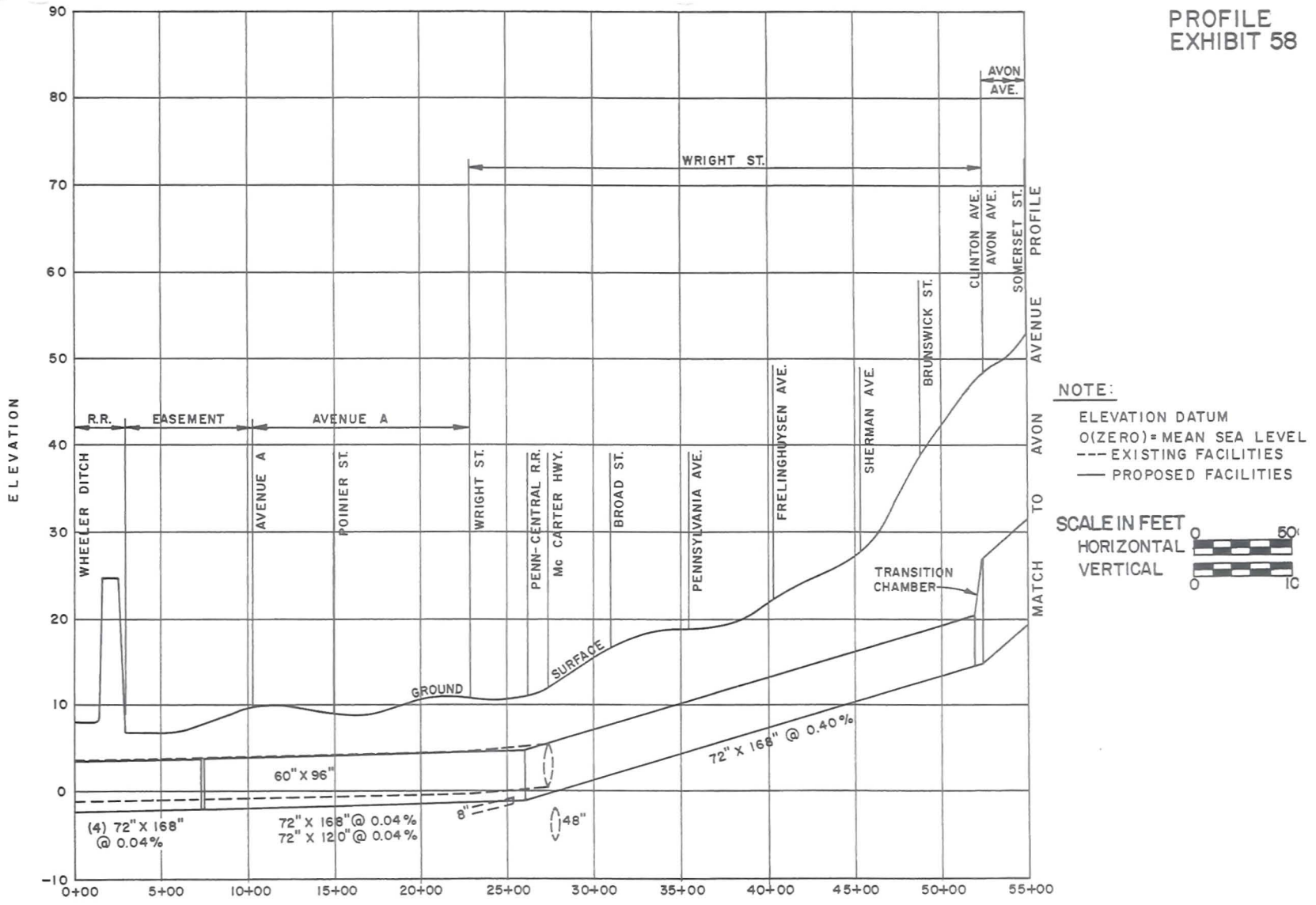
N

SCALE IN FEET

PROPOSED SEWERS
ADAMS DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010608

PROFILE EXHIBIT 58



NOTE:

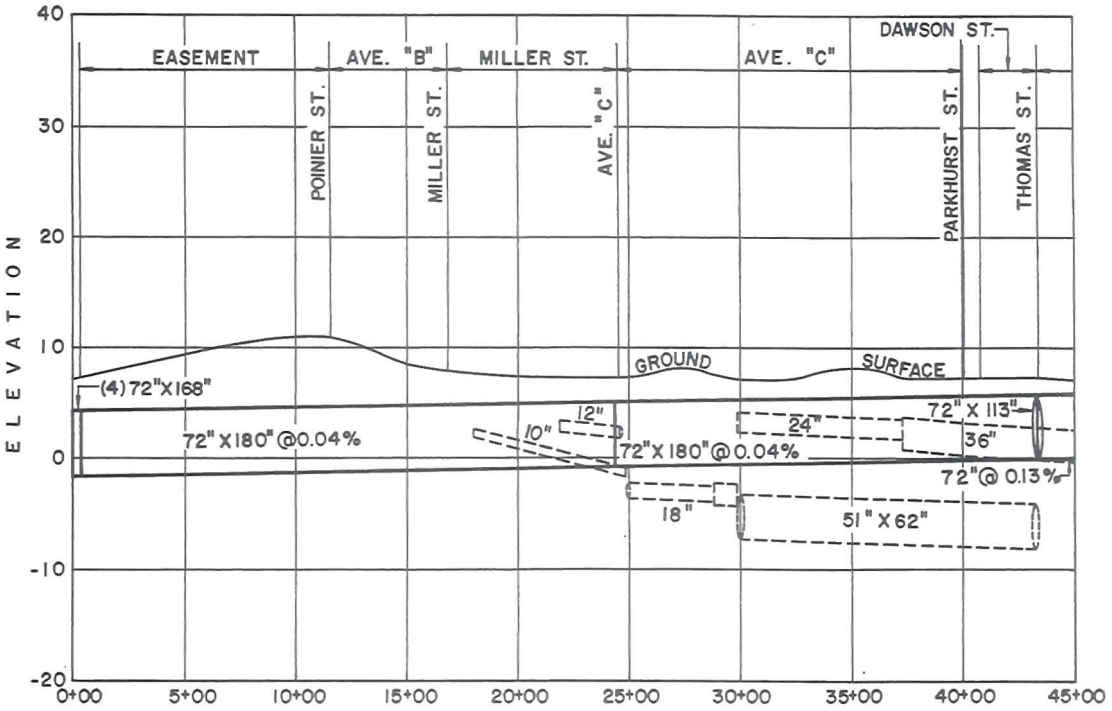
ELEVATION DATUM
0(ZERO) = MEAN SEA LEVEL
--- EXISTING FACILITIES
—— PROPOSED FACILITIES

SCALE IN FEET
HORIZONTAL 0 50
VERTICAL 0 10

AVENUE A

KLL010609

PROFILE
EXHIBIT 59



NOTE:

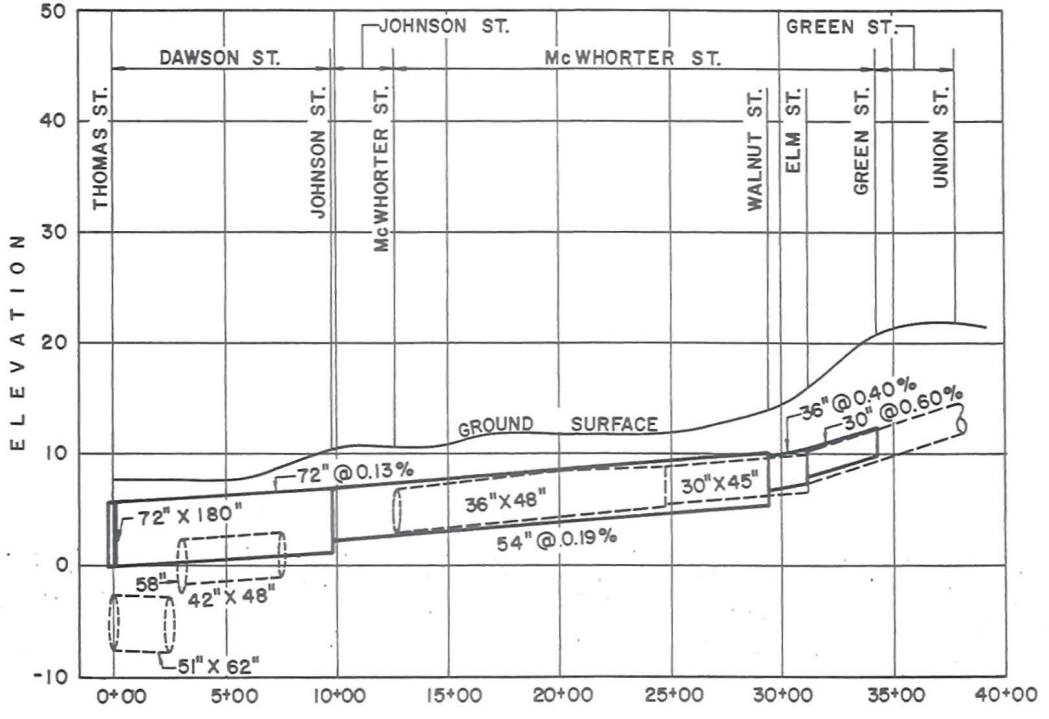
ELEVATION DATUM
0(ZERO) = MEAN SEA LEVEL
---- EXISTING FACILITIES
—— PROPOSED FACILITIES

SCALE IN FEET
HORIZONTAL 0 500
VERTICAL 0 10

AVENUE C

KLL010610

PROFILE
EXHIBIT 60



NOTE:

ELEVATION DATUM
0(ZERO) = MEAN SEA LEVEL
--- EXISTING FACILITIES
— PROPOSED FACILITIES

SCALE IN FEET
HORIZONTAL 0 500
VERTICAL 0 10

McWHORTER ST.

KLL010611

SAYBROOK BASIN

Introduction

The Saybrook Basin includes the Ferry, Jackson, Raymond and Saybrook Districts. These drainage subdivisions are located in the eastern area of Newark along the Passaic River, and contain the majority of the core commercial area of the City. The Ferry District is the easternmost, and borders the Industrial River District on its eastern and southern boundary, the Passaic River on its northern boundary, and the Jackson and Adams Districts on its western boundary. The outfall for this district discharges into the Passaic River at Riverbank Park.

Land use within the district is generally industrial between Ferry Street and the River, with dense residential use between Ferry Street and Independence Park. During dry weather periods the sanitary waste in the combined sewers discharges into the Passaic Valley Sewerage Commissioners Interceptor Sewer in Raymond Boulevard. During periods of wet weather, the sanitary interceptor becomes surcharged, and the combined sewage discharges directly into the river. The major sewers within this overall collection system are illustrated on Exhibit 66.

The Jackson District is a relatively small drainage district immediately to the west of the Ferry District, which discharges into the Passaic River at the Jackson Street Bridge. The area which is drained to this outfall lies between Jackson Street, Lafayette Street, Union Street and the Passaic River. The land use in this district is mixed residential - industrial, with commercial usage along Ferry Street. The existing combined 66" x 78" sewer is connected to the Passaic Valley Interceptor Sewer in Raymond Boulevard. During low flow periods the sanitary waste which is collected in the combined sewer system discharges into the Raymond Boulevard sewer and is conveyed to the Passaic Valley Sewerage Commission treatment plant on Wilson Avenue in the Industrial District. During periods of rainfall, combined sewage overflows the control facility and discharges directly into the Passaic River.

The Raymond District is immediately to the north and west of the Jackson District, and includes the majority of the Central Business District area of the City of Newark. Drainage facilities within this district extend from the river at the Penn-Central Railroad. Station in a southwesterly direction to Kinney Street, in a westerly direction to High Street and in a northerly direction to Raymond Boulevard. The district includes the entire shopping area along Broad Street between Lincoln Park and Market Street. This is some of the most densely developed land in the city with essentially no impervious surfaces, except for a few park areas. The district is drained entirely by a combined sewer system which discharges into the Passaic River at the Penn-Central Railroad Station. The outfall is an 84" by 108" masonry arch which is interconnected with the Passaic Valley Sewerage Commissioners trunk interceptor beneath the Penn-Central Railroad Station. During dry weather periods, the sanitary waste is discharged onto the Passaic Valley Sewerage Commissioners interceptor and is conveyed to the treatment plant on Wilson Avenue. During periods of wet weather flow, the combined sewage overflows directly into the Passaic River beneath the Penn-Central Railroad.

The last subdistrict within the Saybrook Basin is the Saybrook District. The Saybrook District borders the Raymond District on the south and east, the Millbrook District on the norht, and the Peddie District on the west. The Saybrook District drains the area extending from the New Jersey Medical College down through the County Building complex to the Military Park area. This includes the majority of the Prudential Building and other large office buildings in the downtown section of Newark. As in the case of the Raymond District, this area is very heavily developed with commercial and dense residential development. Within the past few years, major revisions have been made to this drainge system because of the construction of the Military Park Parking Garage, the Essex County College and the New Jersey Medical College. This district is also served entirely by combined sewers which are interconnected with the Passaic Valley Sewerage Commissioners trunk interceptor. During wet weather, the combined sewers discharge directly into the Passaic River at the foot of Passaic River Place. During periods of dry weather, the sanitary waste is discharged into the Passaic Valley Sewerage Commissioners interceptor and is conveyed to the treatment plant on Wilson Avenue. The major drainage facilities within the district are shown on Exhibit 66. Exhibits 67 and 68 present the location of the major water, gas, electric and telephone utilities throughout the basin.

Separation Plan

The very intense development within the Saybrook Basin will make it extremely difficult to find a site of sufficient size to construct a combined sewage treatment facility. In addition, the Basin is divided into four separate subdistricts with four individual outfalls going into the Passaic River. The

KLL010622

EXHIBIT 66

EXISTING SEWERS
SAYBROOK BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010623

EXHIBIT 67

EXISTING UTILITIES
SAYBROOK BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010624

EXHIBIT 68

LEGEND

ELEVATION CONTOUR

EXISTING ELECTRIC LINES

EXISTING TELEPHONE LINES

EXISTING UTILITIES
SAYBROOK BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010625

fact that they are spread out over a relatively large area makes it more difficult and more costly to convey the waste to a central location for treatment. For these reasons sewer separation should be utilized in this basin to eliminate the discharge of the combined waste into the Passaic River. Exhibit 69 presents the major collector sanitary sewers which will be required to service this area. Each of these will be connected directly to the Pasaic Valley Sewerage Commissioners trunk line.

In general, the sanitary trunk sewers have been laid out on the same pattern as the existing combined sewers. Since the combined sewers are generally adequate to handle the storm flows, it is recommended that new sanitary sewer collectors and laterals be installed to achieve separation. The estimated construction cost of the sanitary trunk sewers and the necessary laterals required for complete separation is shown in Table VII-18. The total basin includes approximately 1,130 acres and separation will cost approximately $20,898,000.

TABLE VII-18

SAYBROOK BASIN
COST ESTIMATE - SANITARY SEWER

Location	Pipe Sizes In Inches	Estimated Cost
Market St., Springfield Ave., So. Orange Ave., Howard St.	15,21 24,27	$ 996,600
N.J.R.R. Ave., McCarter Hwy., Kinney St., Washington St., Court St., Elm St.	15,21,24 27,30	1,176,000
McCarter Hwy., Rector St., Broad St., Warren St., University Ave.	12,18, 27,30	907,000
River St., McCarter Hwy.	18,21	271,000
Ferry St.	12,18,21	185,000
Merchant St., Pulaski St.	12,15	113,000
Wilson Ave.	12	74,000
Van Buren St.	12,24	226,000
Subtotal		3,948,000
Lateral Sewer - 1130 Acres @$15,000/acre		16,950,000
Total		$20,898,000

Saybrook Basin Storm Drainage

The Ferry and Jackson Districts are heavily developed industrial and residential areas with a rather flat topography. Elm Street reaches an elevation of approximately 25 feet above mean sea level. The Raymond District drains the very heavily developed core area of the City and rises quite rapidly above the river to elevation 25, which extends for a very long distance along McCarter Highway in a southerly direction. To the west the topography rises very sharply along High Street and reaches an elevation approximately 100 feet above mean sea level. The Saybrook District also rises quite sharply above the river with a maximum elevation of approximately 150 feet in the vicinity of the New Jersey Medical School.

The topography within these areas is such that in general tidal flooding does not occur. There are only a few low points along Raymond Boulevard which are subject to any tidal flooding at all. The most significant of these are the underpass of the Jackson Street Bridge and the underpass of the Pennsylvania Railroad Station. The Jackson Street Bridge location has by far the worst frequency of flooding. The Corpos of Engineers has proposed a major flood protection program along the banks of the Passaic River which includes a flood wall and local pumping stations to provide for local drainage. These extensive improvements will only protect a very small area directly bordering the river. Between Raymond Boulevard, River Street, McCarter Highway and the river, there is a thin strip of land generally devoted to industrial use. At the present time there is very little active industry in this area. Beyond the limits of these roadways bordering the river, tidal flooding is not a problem. It, therefore, appears that a more economic solution could be devised which would involve the purchase of land presently not in use and the local protection of the lands which are actively being utilized and which contribute tax revenues to the City. This would eliminate the need for the extensive flood wall program. In addition, the Corps of Engineers has proposed the installation of a pumping station in the Jackson District where it discharges into the river. The Corps of Engineers proposed to construct a 300 c.f.s. capacity pumping station to discharge the runoff from the Jackson District into the river during high flow periods. There is an alternate solution which will provide economy in design.

KLL010626

EXHIBIT 69

SEPARATION PLAN
SAYBROOK BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010627

EXHIBIT 70

LEGEND

ELEVATION CONTOUR

PROPOSED STORM SEWERS

PROPOSED SEWERS

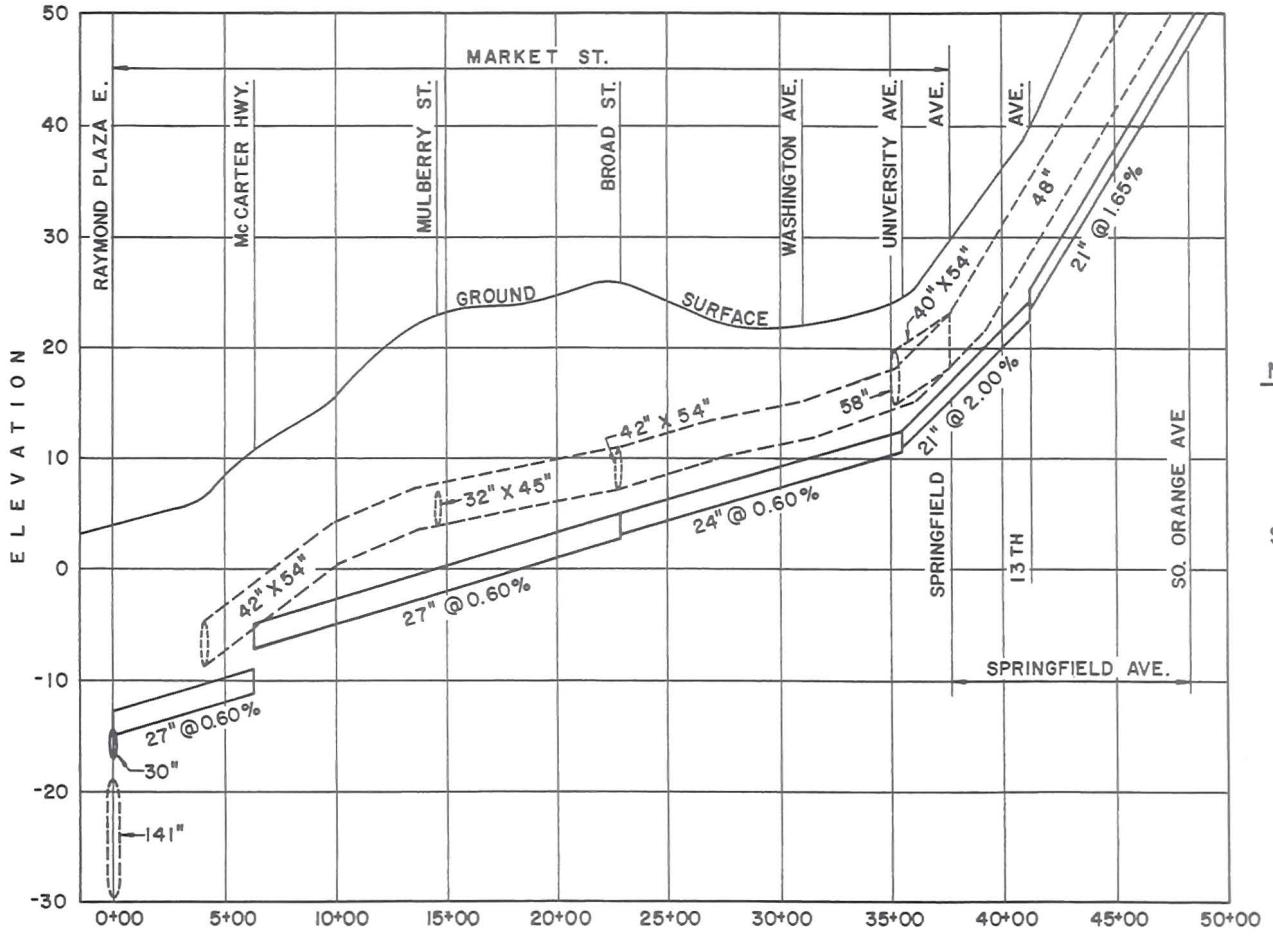
SAYBROOK BASIN

POLLUTION ABATEMENT PLAN

CITY OF NEWARK, NEW JERSEY

KLLC10628

PROFILE
EXHIBIT 7'



NOTE:
ELEVATION DATUM
O(ZERO) = MEAN SEA LEVEL
--- EXISTING FACILITIES
— PROPOSED FACILITIES

SCALE IN FEET
HORIZONTAL 0 500
VERTICAL 0 10

MARKET STREET

KLL010629

The Jackson District discharges into the Passaic River at the Jackson Street Bridge. The outfall is a 66" by 78" arch sewer at a slope of 0.45%. The capacity of this outfall is approximately 250 c.f.s., which is generally adequate to handle the runoff from this relatively small district. However, as previously noted, flooding has been a persistent problem at the Raymond Boulevard underpass of the Jackson Street Bridge. The elevation at the underpass is approximately 6 feet above mean sea level, and during periods of high tides, the river backs up the Jackson Street outfall and forces the storm water out onto Raymond Boulevard through several catch basins located near the low point on Raymond Boulevard. This condition could be corrected if the main Jackson District outfall bypassed these few low elevation catch basins. It is recommended that all direct connections to this main interceptor sewer between Market Street and the river be eliminated. Discharge from the existing catch basins at the low point on Raymond Boulevard between Congress Street and Riverbank Park would then be conveyed to a local pumping station. If a pumping station with a capacity of approximately 50 c.f.s. is installed, this area could be kept dry during the most exteme storms. The cost of these improvements will be substantially less than the major flood wall and 300 c.f.s. pumping station recommended by the U.S. Army Corps of Engineers.

An analysis of the Ferry District indicates the existing storm drainage facilities are generally adequate. Table VII-19 presents a comparison of design capacity and recommended minimum design flow for the drainage facilities in this district.

The Raymond District drains major portions of the core area of the City of Newark. The major drainage facilities run along McCarter Highway adjacent to the Pennsylvania Railroad. Slopes are extremely flat on these major conduits and the hydraulic analysis indicates that there is some inadequacy in the major storm drains between the Passaic River and East Kinney Street. Table VII-20 presents a comparison of design capacity and recommended minimum design flow for the drainage facilities in this district.

TABLE VII-19

FERRY DISTRICT
EXISTING SEWER CAPACITY' VS.
DESIGN FLOW

Location	Size in Slope	Existing Capacity	Minimum Design Flow
Pulaski St. and Lafayette St.	60" Dia. at a slope of 0.12%	33 c.f.s.	58 c.f.s.
Pulaski St. at Wilson Ave.	72" x 78" at a slope of 0.20%	85 c.f.s.	79c.f.s.
Van Buren St. at Lafayette St.	36" x 48" at a slope of 0.15%	35 c.f.s.	52 c.f.s.
Van Buren St. at Colver St.	48" x 60" at a slope of 0.24%	90 c.f.s.	86 c.f.s.
Polk St. at Market St.	84" x 96" at a slope of 0.18%	300 c.f.s.	330 c.f.s.

KLLC10630

TABLE VII-20

RAYMOND DISTRICT

EXISTING SEWER CAPACITY VS. DESIGN FLOW

Location	Size in Slope	Existing Capacity	Minimum Design Flow
McCarter Highway at Lafayette St.	66" Dia. at 0.10%	180 c.f.s.	310 c.f.s.
Kinney St. at Broad St.	66" x 78" at 0.28%	200 c.f.s.	265 c.f.s
Market St. at Broad St.	42" x 54" at 0.35%	75 c.f.s.	110 c.f.s.
N.J. R.R. Ave. at Edison St.	69" x 96" at 0.12%	210 c.f.s.	310 c.f.s.
Raymond Plaza Outfall at Raymond Blvd.	84" x 108" at 0.17%	350 c.f.s.	413 c.f.s.

The recommended improvements for this district are presented on Table VII-21. The priority for these improvements should be relatively low in that major flooding has not been reported.

TABLE VII-21

RAYMOND DISTRICT

STORM SEWER COST ESTIMATE

Location	Pipe Size in Inches	Estimated Cost
Raymond Blvd.	Pump Station	$ 130,000
Total		$ 130,000
E. Kinney St.	48	$ 170,000
McCarter Hwy.	66	352,000
Lafayette St.	66	39,000
N.J.R.R. Ave.	66	176,000
Raymond Pl.	66,72	268,000
Market St.	42	100,000
Total		$1,105,000

KLL010631

MILLBROOK BASIN

Introduction

The Millbrook Basin is located in the northernmost area of the City of Newark along the Passaic River. The land use within this basin is primarily residential, except for a strip of industrial land approximately 1000 feet wide along the Passaic and Second Rivers. The basin contains a total area of approximately 2800 acres of which 2400 are essentially fully developed. The predominant feature within this basin is Branch Brook Park which occupies approximately 400 acres.

This area of the City comprises the North Ward, and contains the largest portion of the City's single family home zoning. As a result of the park and the single family zoning, the intensity of use within this district is substantially lower than the previously described districts within the City. This results in a lower rate of storm runoff and a lesser sanitary flow on a unit area basis.

Millbrook Basin has been broken down into five separate subdistricts. Each of these districts has it own outfall and lateral sewer system The first of these districts within the Millbrook Basin is the Millbrook District which drains an area extending from the northern end of Branch Brook Park to South Orange Avenue on the south. The collector sewers within the Millbrook District join at the southerly end of Branch Brook Park and then flow in an easterly direction discharging into the Passaic River at Clay Street. A second outfall is located at the foot of Clark Street. During dry weather periods the sanitary wastes are discharged into the Passaic Valley Sewerage Commissioners Interceptor Sewer. However, during periods of storm flow the combined sewage from both these outfalls is discharged directly into the Passaic River without treatment.

The second district within this basin is called the Fourth Avenue District. It actually includes two small subdistricts which have their own individual connections to the Passaic Valley Sewerage Commissioners Interceptor Sewer in McCarter Highway and their own outfalls to the Passaic River on Fourth Avenue and Oriental Street. Each of these districts is presently served by a combined sewage system which collects the waste from the area to the east of the ridge line which generally falls along Clifton Avenue and Ridge Street. As previously stated, the first five blocks to the west of the Passaic River are generally industrial use, with the area to the west of Broadway being mostly R-3 residential. The topography within these small districts is quite steep with the ridge line at about elevation 150. The average slope in the direction of the river is in the order of 5 to 7 percent and the area drains very well.

The third district within the Millbrook Basin is the Herbert District, which includes two small subdistricts served by combined sewers with individual connections to the Passaic Valley Sewerage Commissioners Interceptor Sewer in McCarter Highway. Each subdistrict also has its own outfall to the Passaic River located on Herbert Place and Delavan Avenue respectively.

The fourth district within the Millbrook Basin is the Verona District. This district is also served by combined sewers with the main trunk line running along Verona Avenue from McCarter Highway to Highland Avenue. Verona District is the northernmost district within the City of Newark and lies along the Second River which forms the boundary with the Town of Belleville. The Verona Collector Sewer is connected to the Passaic Valley Sewerage Commissioners Interceptor Sewer at the intersection of Verona Avenue and McCarter Highway. During periods of dry weather flow the sanitary waste is discharged into the Interceptor, but during wet weather the combined sewage discharges directly into the Passaic River.

The fifth district within this basin is the Roseville District. The Roseville District is served by separate storm and sanitary sewers. Sanitary wastes are discharged into the Second River Joint Meeting trunk sewer which parallels the Second River and connects to the Passaic Valley Sewerage Commissioners Interceptor in McCarter Highway. The storm flow from this district is conveyed in a major storm drain extending from the intersection of North Thirteenth Street and Sixth Avenue on the outer extremity to the northwesterly corner of the City of Newark near Franklin Avenue on the Belleville border. Approximately 360 acres of the City of East Orange discharges storm drainage into this trunk storm sewer. Exhibits 73 and 74 present the location of the major water, gas, electric and telephone utilities throughout this basin.

Separation Plan

The total area within the Millbrook Basin is approximately 2800 acres. As previously noted, the Roseville Subdistrict is already served by separate sanitary sewers. In addition, approximately 400 acres of the basin is oc-

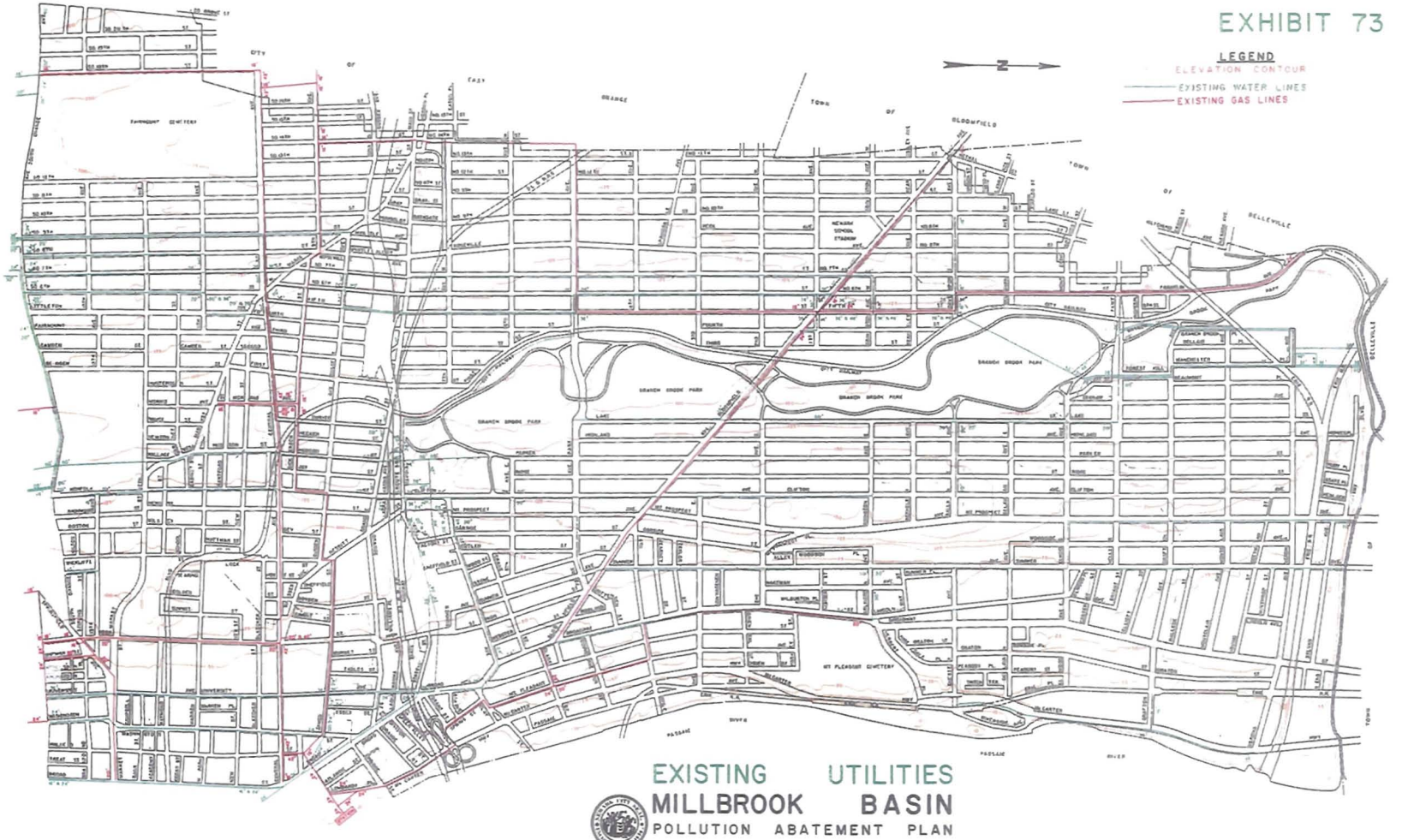
KLL010632

EXHIBIT 72

EXISTING SEWERS
MILLBROOK BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010633

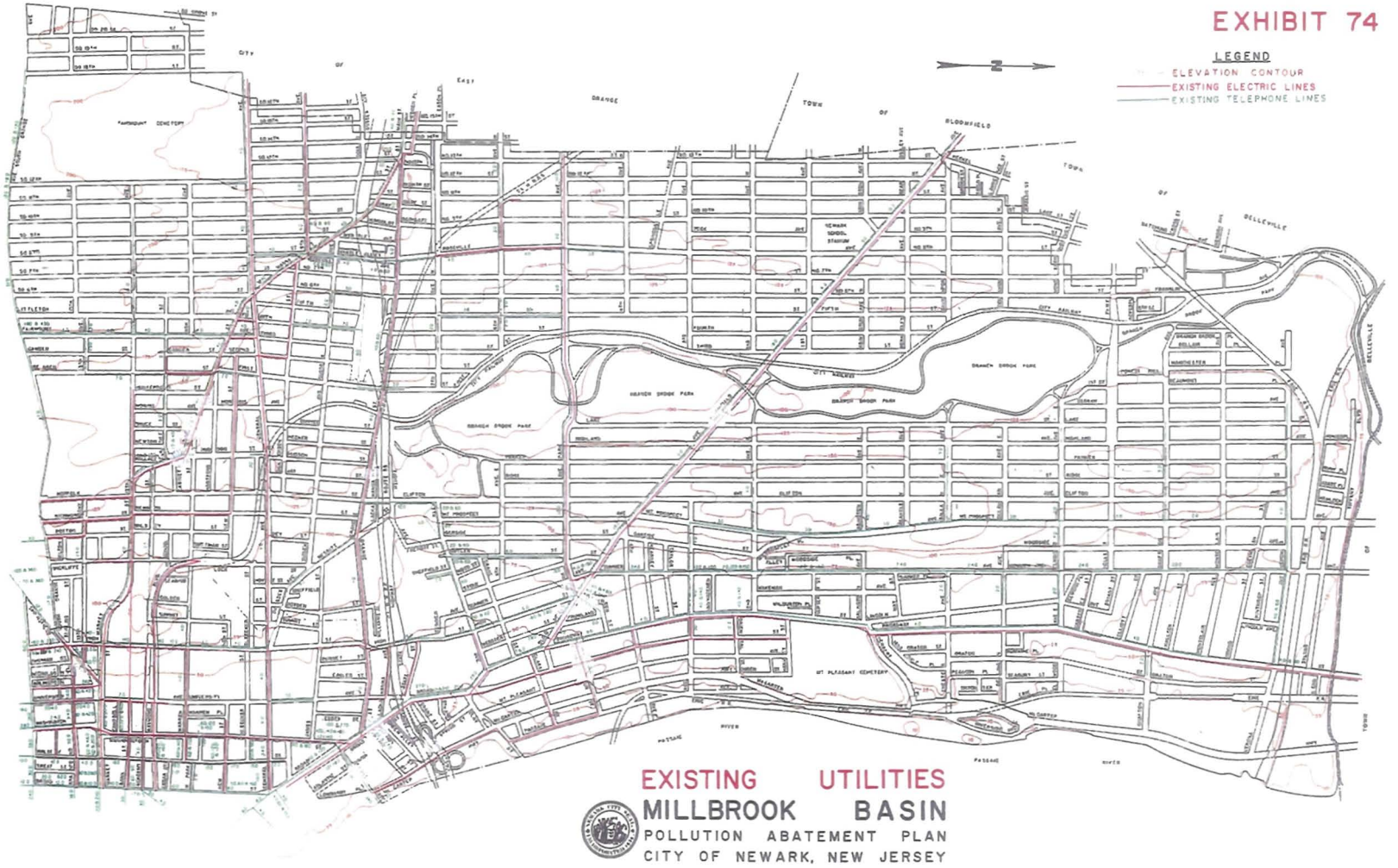
EXHIBIT 73



EXISTING UTILITIES
MILLBROOK BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLLC10634

EXHIBIT 74



EXISTING UTILITIES
MILLBROOK BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010633

cupied by Branch Brook Park. However, the remaining area of approximately 2000 acres is presently served by combined sewers. With a majority of this basin being occupied by residential land use, the street grid pattern is quite small and there are a large number of connections to the existing combined sewage system.

Exhibit 75 presents the trunk interceptor sanitary sewers which would be required if separation were to be effected. It will be the alignment of existing combined sewers which will facilitate the required connection of lateral sewers throughout the district.

Presently the City has numerous connections to the Passaic Valley Sewerage Commissioners Interceptor Sewer, but these connections are not metered, and the flow from the City system cannot accurately be determined. The best way to illustrate that a sanitary sewage system operates efficiently, and also provide a good basis for determining treatment charges, is to have a continuous record of flow through the sewage system. For this reason it is recommended that each new sanitary sewer connection to the Passaic Valley Interceptor Sewer be provided with a meter chamber. The metering chambers are relatively expensive and therefore the number of connections should be minimized. Table VII-22 entitled Cost Estimate - Millbrook Basin Sanitary Sewer Separation Plan indicates a total cost of separation for this basin of $34.4 million.

The largest area within this basin, the Millbrook District, occupies over 1,300 acres which all drains into the Passaic River at Clay Street except for the Clark Street area. With such a large area being collected and brought to a single point it might be feasible to consider combined sewer overflow treatment for this basin. Combined sewage from the smaller districts to the north could also be diverted to the combined sewage treatment facility. Land is quite scarce in this district and substantial acreage would be required for the construction of a treatment facility. One possible location would be the vicinity of Broad Street. Generally the area to the west of Broad Street could be connected to this facility. The remaining area to the east of Broad Street and the Verona District would have to be separated. The land area within this area of separation would be approximately 600 acres rather than 2000 which occupies the entire district. The estimated cost of separating only these areas along the river and within the Verona District is $13 million as opposed to the $34.4 million for the total separation.

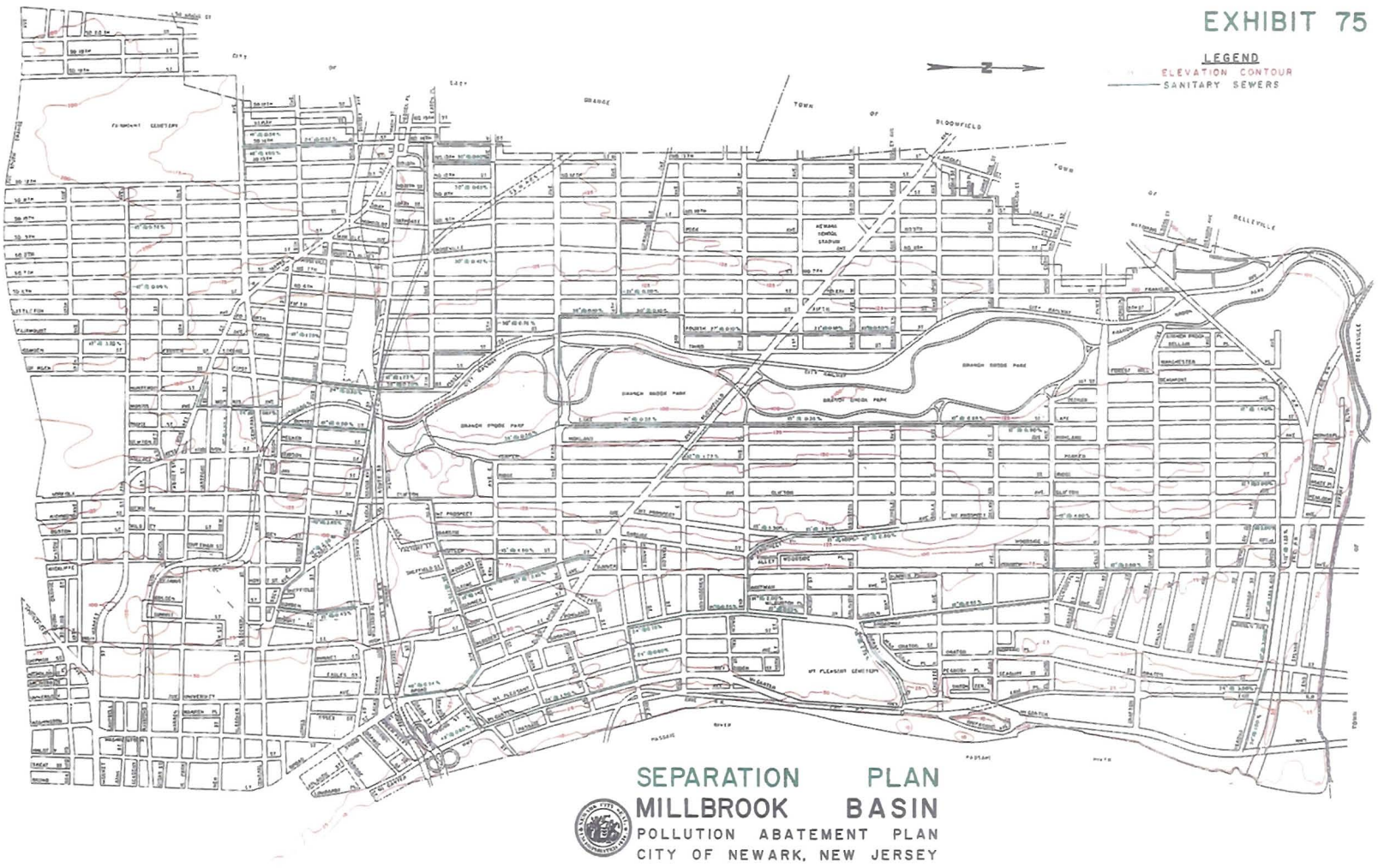
TABLE VII-22

COST ESTIMATE
MILLBROOK BASIN SANITARY SEWER
SEPARATION PLAN

Location	Pipe Size in Inches	Estimated Cost
12th Ave.	12,15	$ 155,000
Central Ave.	18	131,000
So. Fourteenth St.	24	71,000
Thirteenth St.	30	221,000
Sixth Ave.	15,30	983,000
Third St.	36	2,113,000
Orange St.	12	96,000
Broad St.	48	222,000
Clay St.	48	123,000
Dickerson St.	15,24	426,000
W. Market	18	101,000
Morris	24	57,000
Duryee St.	12,15	207,000
Sussex Ave.	10,12,15	254,000
Springdale	21	224,000
Fourth Ave.	10,21,27	261,000
Third Ave.	27	26,000
Fifth Ave.	30,36	232,000
Park Ave.	36	234,000
Lake St.	12,15,21	789,000
Bloomfield Ave.	12	101,000
Branch Brook Park	36	320,000
Seventh Ave.	36	437,000
Broadway	15,21,24,36	487,000
Stone St.	15	247,000
Mt. Prospect Ave.	15	153,000
Mt. Prospect Pl.	15,18	212,000
McCarter.Hwy.	24	241,000
Summer Ave.	12	109,000
Elmwood Ave.	12,18	329,000
Lincoln Ave.	18	124,000
Herbert Pl.	18	157,000
Verna Ave.	12,15,24	550,000
Subtotal		10,393,000
Lateral Sewer Cost 2000 acres x $12,000		24,000,000
Total		$34,393,000

KLL010636

EXHIBIT 75



SEPARATION PLAN
MILLBROOK BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLLC10637

Storm Drainage Analysis

The storm drainage facilities within the Millbrook Basin in general have acceptable capacities. There are a few exceptions which will be described in this section of the report.

The Millbrook District drains an area extending from the Fairmount Cemetery southwest to the northern end of Branch Brook Park. Branch Brook Park occupies the central area of the district and contains several ponds which are fed solely by rainfall falling within the park area. The ponds are controlled by overflow weirs which have very restrictive outlets and essentially the park area contributes negligible flow to the storm runoff of the basin.

At the City of East Orange border with Newark storm drainage is now carried under Route 280 in a 3' x 13' box culvert generally along the former alignment of South 16th Street. The culvert has an actual capacity of 240 c.f.s, but analysis of the tributary area indicates a design flow of 350 c.f.s. Because of the cost involved in increasing the capacity of this crossing, it is recommended that supplementary facilities not be installed. After passing under Route 280, the drainage system continues in an easterly direction along Seventh Avenue to the Erie-Lackawanna Railroad. The railroad is in a depressed section in this area, and the storm drainage system is carried in a 48" x 87" culvert installed within the retaining wall of the depressed railroad. The culvert has a capacity of approximately 300 c.f.s., compared with a computed design flow of 477 c.f.s. However, because of the restriction upstream at the Route 280 crossing, the peak flow of 477 c.f.s cannot be attained. This system then connects to the main outfall near the intersection of Duryea and Orange Streets. Another major branch of this system originates at the northern end of Branch Brook Park and flows in a southerly direction through the park. A small trunk located in Fourth Street is connected to this branch near Third Avenue. This facility is of marginal capacity, but since severe flooding has not been reported in this location, we do not recommend the installation of relief facilities at this time.

The Branch Brook Park interceptor flows through the park land between Park Avenue and the extension of Seventh Street. In this area the interceptor is 96 inches in diameter and has a slope of 0.1%. The capacity of this sewer is 265 c.f.s. with a peak design flow of approximately 505 c.f.s. During the five year frequency design storm it is estimated the sewer would be surcharged for approximately 25 minutes. If the sewer were to overflow at this location it would discharge the combined sewage into the pond in Branch Brook Park. No history of this overflow has been reported but this condition should be watched to insure that the quality of the ponds within the park is not compromised.

The Branch Brook Park interceptor joins the main outfall at the eastern edge of the park near the intersection of Duryea and Orange Streets. A twin outfall consisting of 96" and 72" culverts then flows in an easterly direction towards the Passaic River. Through this reach the two lines have a combined capacity of 860 c.f.s compared to a design peak flow of approximately 1447 c.f.s. During a five year frequency design storm it is estimated that this outfall will be surcharged for approximately 32 minutes. This line is quite inadequate in comparison to the desirable design capacity at this point, but apparently upstream restrictions in the Branch Brook Park and South Fourteenth Street interceptors have sufficiently dampened the peak flows to prevent an overflow.

From Clifton Avenue to the Passaic River the slope of the interceptor sewers increases greatly. With this increase in the slope, the capacity of the trunk lines also increases, and from Clifton Street to the river the interceptor sewers are generally adequate.

The subdistricts to the north of the Millbrook District along the Passaic River are presently served by combined sewers. In general these combined sewers are of marginal capacity having approximately two-thirds of the capacity of the recommended design flow. However, with the generally steep slope in the direction of the Passaic River, ponding does not occur and flooding or flood damage is minimal. The only hazard which exists is the great amounts of excess gutter flow which affect traffic during intense storm periods. Providing relief sewers in this area can most probably not be justified on an economic basis.

KLL010638

AIRPORT BASIN

Introduction

The Airport Basin contains a total of 1,853 acres including the airport itself and the surrounding roadways. This basin has been isolated from Newark Bay by the construction of the New Jersey Turnpike, resulting in a single outlet for the peripheral ditch opposite the westerly end of the Elizabeth ship channel. The Turnpike has been defined as the easterly boundary of this basin which is bounded on both the west and north by Route 1-9. The southerly boundary is North Avenue in the City of Elizabeth. As shown on Exhibit 76, except for the northeasterly corner, all the drainage facilities in the airport drain to the peripheral ditch. They have been designed by the Port of New York Authority to provide adequate drainage of the runways and terminals to the peripheral ditch with a maximum water surface of 2.65 feet above mean sea level (Elev. 300' on Port Authority Datum). This criteria is of major importance in designing the storm water pump station which will be discussed in more detail later in this report. A detailed analysis of the sewers or storm drains in this basin has not been conducted since the City of Newark has no responsibility for determining drainage criteria or providing drainage facilities for the airport or state highways that surround it.

The only analysis that will be made on the local drainage facilities in this basin will be to determine their influence upon the peripheral ditch and their effect on the drainage from the City of Newark. The Fairmont and Alina Districts of Elizabeth will be treated in the same manner. A storm flow hydrograph was developed for their outfalls to the peripheral ditch which considered only how it effects the drainage from the City of Newark. Exhibits 77 and 78 present the location of the major water, gas, electric and telephone utilities throughout this District.

The Adams, Wheeler, Peddie, Queen and Waverly Districts drain into the flat meadowland area principally occupied by the airport. The heavily developed fringe areas of each of these districts has been reclaimed from this tidal area by filling the land to above normal high tide levels. The runoff from these areas used to run off into the open meadows and gradually flow into the Newark Bay. Only during extremely high tides did water back up into the lower areas surrounding the meadows.

Within the past decade a tremendous amount of development has taken place in the Newark Meadows. The Port of New York Authority has undertaken a multi-million dollar expansion of Newark Airport. To facilitate this expansion the main channel that drains the Newark Districts was reconstructed around the periphery of the airport. In addition, existing major highways have been expanded and improved, and Route 78 has been constructed.

Two previous reports have dealt with the flooding problems of the low areas that surround the Newark Meadows. The "Newark Meadows Flood Control Pumping Station" was prepared in 1960 by Elson T. Killam Associates and the second "Newark Meadows Pumping Station" was prepared by James P. Purcell Associates in 1970. Both reports dealt almost exclusively with the ditch system and immediately surrounding low areas which experience extensive flooding. In both reports the need for the construction of a storm water pumping station was established by the fact that some of the low areas are below the elevation of anticipated high tides and the friction losses through the channels would surcharge the drainage systems causing an even greater depth of flooding. As the development of the Meadows continues this condition becomes worse making a storm water pumping station more necessary. The existing drainage ditches run the gamut of concrete box culverts, trapezoidal earth, timber sheet piling, steel sheet piling, and pile-supported wooden deck culverts. Unfortunately, all of these sections are heavily silted and in need of cleaning. This was recommended in both of the above-mentioned reports and is still in urgent need.

These two recommendations, the construction of a storm water pumping station and the cleaning of the ditches, form the basis of the drainage improvement program recommended for this basin. This report, being a complete basin study and master plan, has a great advantage over the previous reports. The complete evaluation of the existing drainage system and the conceptual design of overall basin improvements yields an understanding of many conditions and problems which is not possible in the study of an isolated portion of a watershed. Further advantage is derived from the fact that final design fo some facilities is now underway. This has made topographic, geologic and utility surveys available as well as a more detailed analysis than is normallly available at the time of a master plan report. Being readily available this information has been applied to this report.

The drainage of each of the major basins has previously been discussed. The effective drainage area at the intersection of Wheeler and Peddie ditches is approximately 3,600 acres, and has a time of concentration of 45 minutes. The sum of the individual basin minimum recommended design flows is in the order of 4,200c.f.s. When the additional areas east of the

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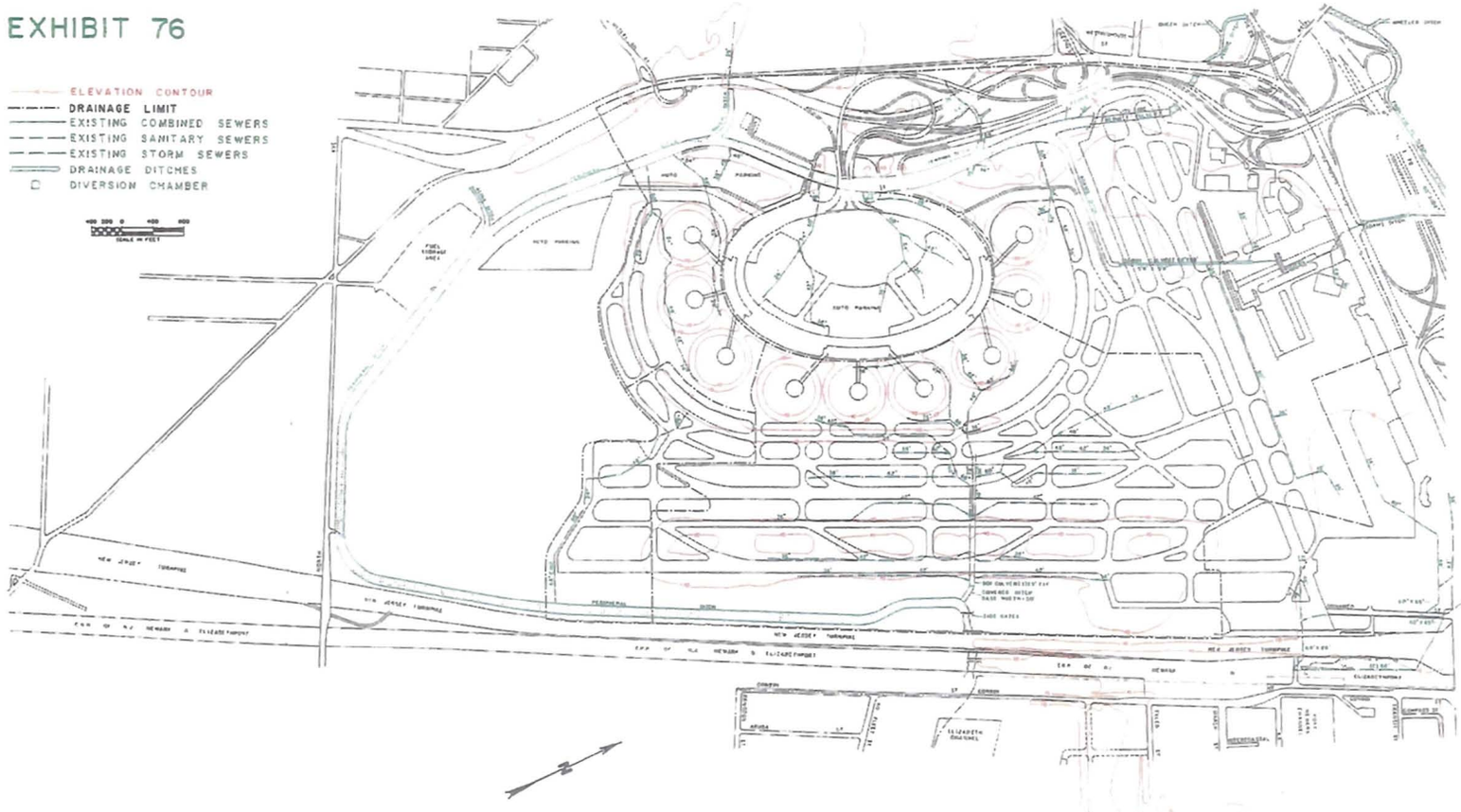
EXHIBIT 76

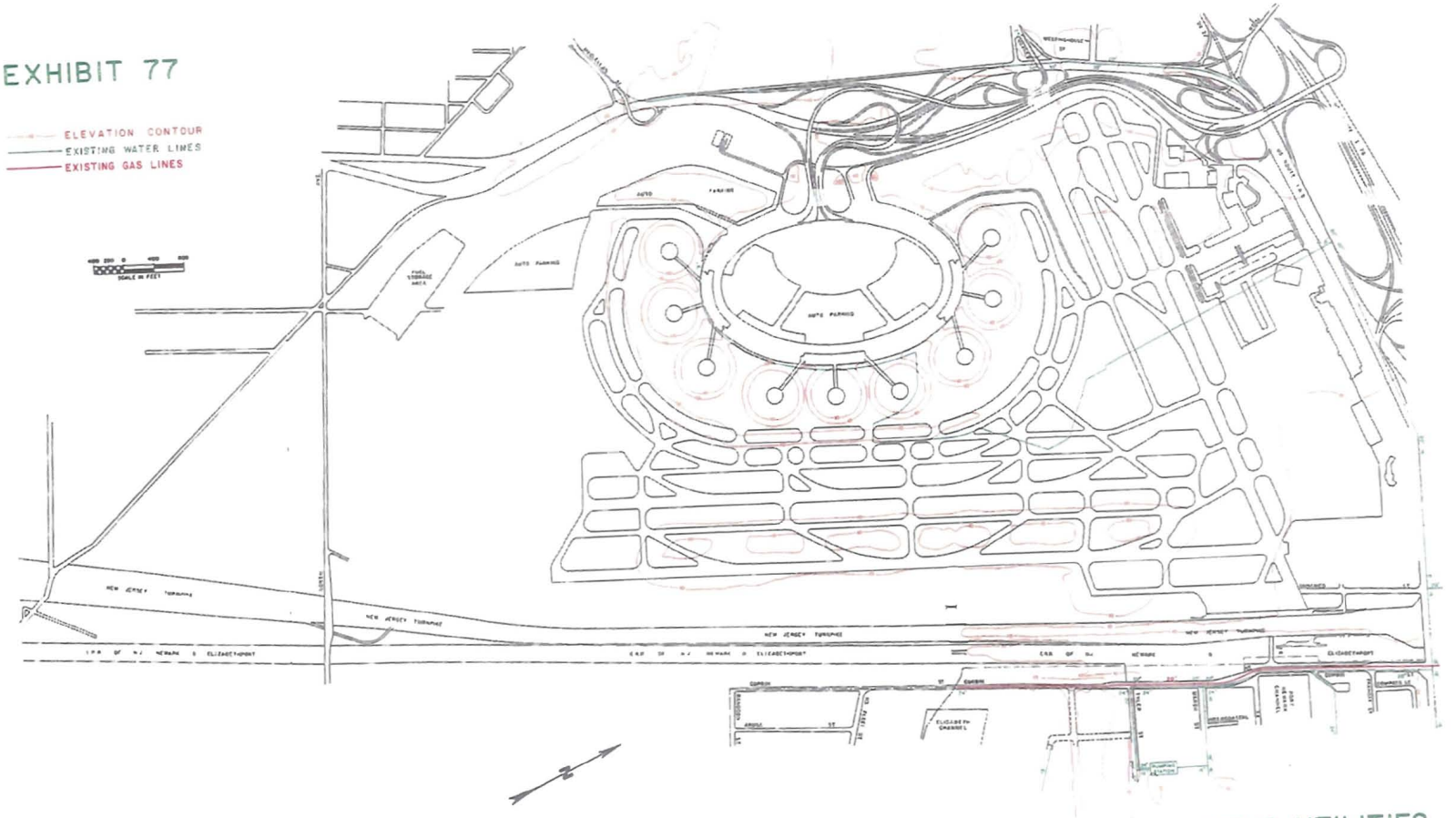


EXISTING SEWERS
AIRPORT BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010640

EXHIBIT 77

ELEVATION CONTOUR
EXISTING WATER LINES
EXISTING GAS LINES

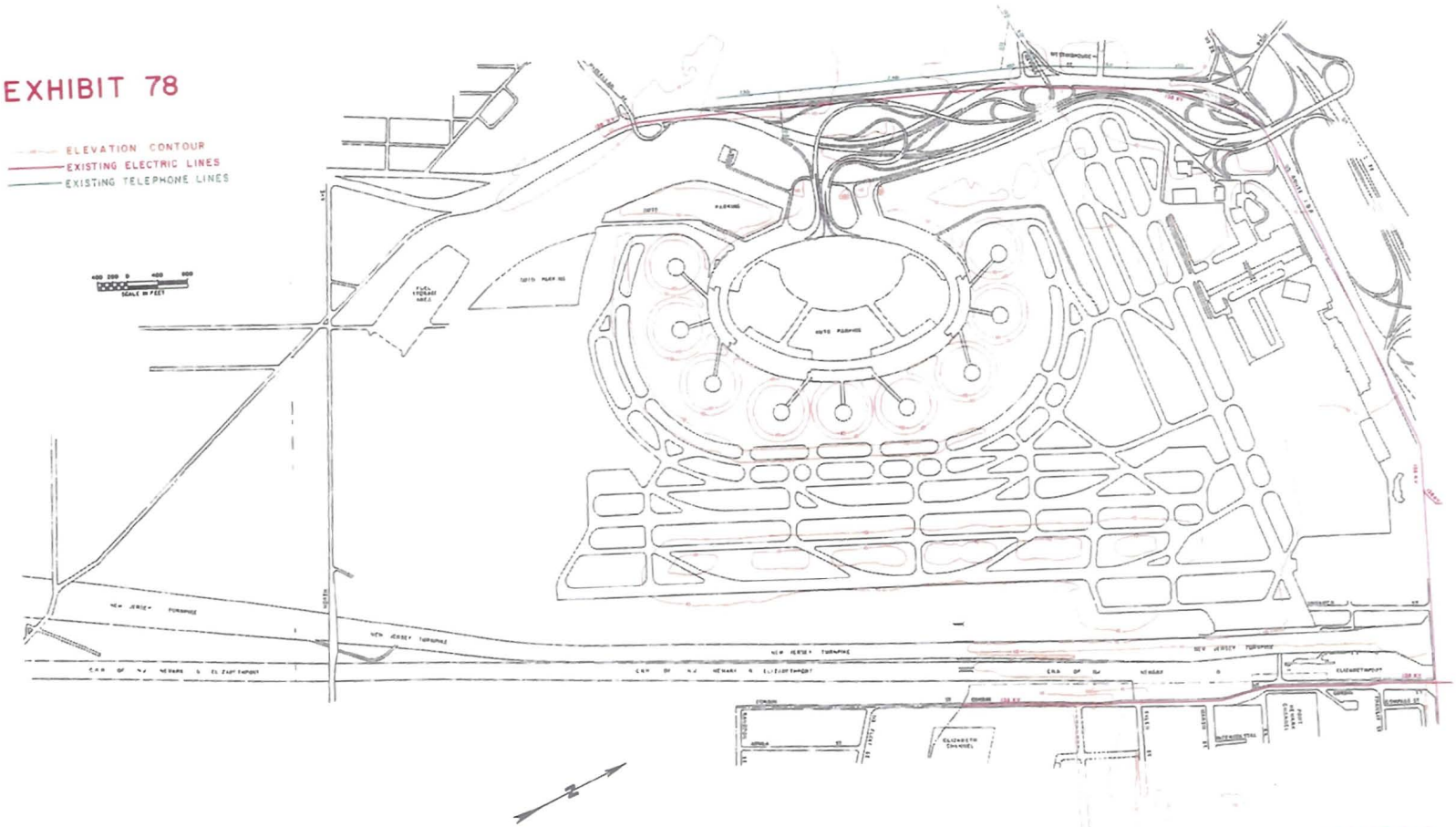


EXISTING UTILITIES
AIRPORT BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010641

EXHIBIT 78

ELEVATION CONTOUR
EXISTING ELECTRIC LINES
EXISTING TELEPHONE LINES



EXISTING UTILITIES
AIRPORT BASIN
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLLC10642

Penn Central Railroad are added, the 5-year frequency design flow would be in the order of 4,350 c.f.s. This flow is substantially higher than that determined in either of the previous reports. There are two major reasons for this. First, the time of concentration has been decreased by the proposed diversion of the northern half of Peddie District. Second, the evaluation of the present and proposed land use, as previously described in this report, has resulted in a significantly higher runoff coefficient.

As the flow moves down the peripheral ditch the additional tributary area contributes flow tending to increase it. However, there are two factors that simultaneously tend to decrease the flow. The first, is the time of travel in the channel which is added to the time of concentration resulting in a smaller average intensity rainfall over the watershed. The second, is the folume of water that must go into storage in the channel to increase the flow depth and provide the higher hydraulic gradient. A preliminary analysis indicates that these three factors negate each other resulting in a peak flow from a 5-year frequency storm of approximately 4,000c.f.s. at the New Jersey Turnpike, very close to the peak flow determined at the junction of Peddie and Wheeler Ditches. The one-year and fifty-year frequency storms have been estimated to develop peak flows at the Turnpike of 2,500 and 6,500 c.f.s., respectively. As in the case of the 5-year frequency storm, the peak flow remained almost constant throughout the 22,000-foot length of the Peripheral Ditch. Detailed flood routing has not been conducted, but will be for the final design of the pump station. The flows described above represent the peak flows which will occur at various points along the Peripheral Ditch at varying times. At any specific time, however, the flow rate in the Peripheral Ditch will vary from one point to the next.

Approximately 45 minutes after the most intense period of rainfall, the peak flow of 4,350c.f.s. occurs at the junction of the Peddie and Wheeler Ditches. However, at that time only a small area of the Airport will be contributing flow to the Peripheral Ditch at the Turnpike which will result in a flow of approximately 500 c.f.s. Thus, early in the storm the flow in the upstream reaches will exceed that at the outlet. The opposite is true later in the storm. When the peak flow of 4,000c.f.s. is obtained at the Turnpike, a flow of approximately 2,200 c.f.s. will be occurring at the upstream end of the Peripheral Ditch. The analysis of this unsteady flow condition and the determination of controlling flows will be made during the final design of the pump station.

To simplify the preliminary hydraulic analysis of various improvement alternatives, a uniform flow rate approximately equal to the average flow rate throughout the length of the Peripheral Ditch has been assumed. This flow rate of 3,000c.f.s. has been used to approximate the controlling conditions of a 5-year frequency storm, which is felt to be the minimum frequency for which the ditches and pump station should be designed.

An analysis of the Peripheral Ditch with a storm water pump station located immediately upstream of the New Jersey Turnpike has been conducted. This location was previously recommended because the Peripheral Ditch would serve as a tremendous forbay greatly reducing the peak flow to the pump station. The objective of the analysis was to determine what combination of pump station capacity and improved drainage ditches would provide adequate drainage at a minimum cost. The approach taken was to design the drainage culverts serving the critically low areas at minimum slope to keep the crown elevations as high as possible. This will allow the highest possible elevation to occur in the ditches without surcharging the culverts. Exhibit 80 shows the two culverts which drain the critical low spots at Meeker Street and Route 22 and the intersection at Thomas and Jefferson Streets. The maximum desirable water surface elevation at both otulets has been established as elevation +2. An attempt was then made to pass a 5-year frequency design flow, approximated at 3,000c.f.s., through the ditch system and obtain this desired water surface at the outlets. A Manning coefficient of 0.03 was used for the existing earth channel. The resulting profile has been tabulated under Item 1 in Table VII-23. An initial water surface elevation of -0.4 was assumed at the suction side of the pump station. The backwater profile shows that a water surface elevation of 5.2 and 7.8 will be reached at the Waverly Ditch junction and at the west side of Route 1-9, respectively. Approximately two more feet of loss would occur between Route 1-9 and the outfalls which would result in a water surface elevation of 9.8 at the outlets. Flows of 1,000 and 2,000 c.f.s. were also passed through the system and water surface elevations of 3.2 and 6.2, respectively, were obtained at the outlets. Thus, it is apparent that the existing peripheral ditch is inadequate to pass a one-year frequency storm estimated to average 3,300 c.f.s. and meet the required water surface elevation of +2 at the outlets.

Several approaches were tried to increase the capacity of the Peripheral Ditch. The trials and the results are tabulated in Table VII-23. As shown on Exhibit 76 there are six locations where bridges cross the Peripheral Ditch. These are generally three-span bridges, supported on low abutments and two piers which rest on pilings. The trapezoidal shape and the 80-foot base width channel is maintained through the bridges. The only restriction is the minor one caused by the two rows of concrete piers. However, the design is

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such that the trapezoidal channel cannot be widened through the bridges. For this reason a widening of the Peripheral Ditch has not been considered. The possibility of lining the channel to obtain a smoother section which would reduce the head loss was investigated.

As shown in Item 1 in Table VII-23 this reduced the water surface at Route 1-9 by 2.6 feet to elevation 5.2. This is still far in excess of the elevation of 0.5 required at this location to provide adequate drainage.

Lowering the suction water level was also investigated. Item 3 in Table VII-23 shows that lowering the water level at the pump station is of no benefit and would require a substantial amount of additional pumping to maintain the water level at elevation -2.4 which is below mean sea level and below the water table for some areas of the Meadows.

The final alternative investigated was the lowering of the invert of the Peripheral Ditch by two feet from the existing tide gates to the runway 29 culvert. The side slopes of the peripheral ditch were projected downward requiring only the excavation of the bottom material. The estimated cost of the excavation is $840,000 which would result in a 1.3 foot reduction of the water surface at Route 1-9 to elevation 6.5. Several combinations of these three alternatives are shown in Table VII-23, none of which are capable of carrying a 5 year frequency storm. The most hydraulically efficient alternative which can meet the criteria is for a flow rate of only 1000 c.f.s. The water surface at Route 1-9 with a flow 1000 c.f.s. in the channel as described in Item 6, would be +0.3. This is not considered to be a sufficiently high flow rate, and in addition, the concrete lining of the Peripheral Ditch would cost approximately $9,600,000. This expenditure is not considered warranted by the results which would be obtained. To verify the results obtained using the average steady flow, an analysis was performed using stepped flow increments for the 5 year frequency flow. The results were in good agreement with those obtained using the average flow, thereby substantiating the analysis.

A thorough investigation of the hydraulic characteristics of the Peripheral Ditch was then conducted to try to isolate the locations of the backwater control points for these various schemes. The Peripheral Ditch was found to control the water surface elevations to the west of Route 1-9 for all schemes investigated. It was found that to obtain the desired elevation of +0.5 at the Route 1-9 culverts, the Peripheral Ditch, and the normal ditch water level would have to be lowered approximately 8 feet. This solution is not practical, which led to other investigations.

TABLE VII-23

PERIPHERAL DITCH
3000 c f.s BACK WATER PROFILES

Item No.	Description	Water Surface Elevation: Pump* Station	At Waverly Ditch	West of Route 1-9
1	Existing ditch	-0.4	5.2	7.8
2	Existing ditch concrete lines	-0.4	2.5	5.2
3	Existing ditch water level lowered 2 feet	-2.4	5.1	7.7
4	Water level lowered 2 feet and concrete lined	-2.4	2.3	5.1
5	Invert lowered 2 feet and water level lowered 2 feet	-2.4	3.8	6.3
6	Invert lowered 2 feet water level lowered two feet and concrete lined	2.4	0.9	4.3
	Recommended Plan			
7	Invert lowered 2 feet	-0.4	4.0	6.5

*Pump Station located at New Jersey Turnpike

The first alternative tried was to move the pump station to a location where it could draw the water level down to elevation +2 at the outlets. Several pump station locations downstream of Route 1-9 were investigated but the results were still unsatisfactory because the desired water surface elevation at Route 1-9 could not be obtained. This investigation brought to light

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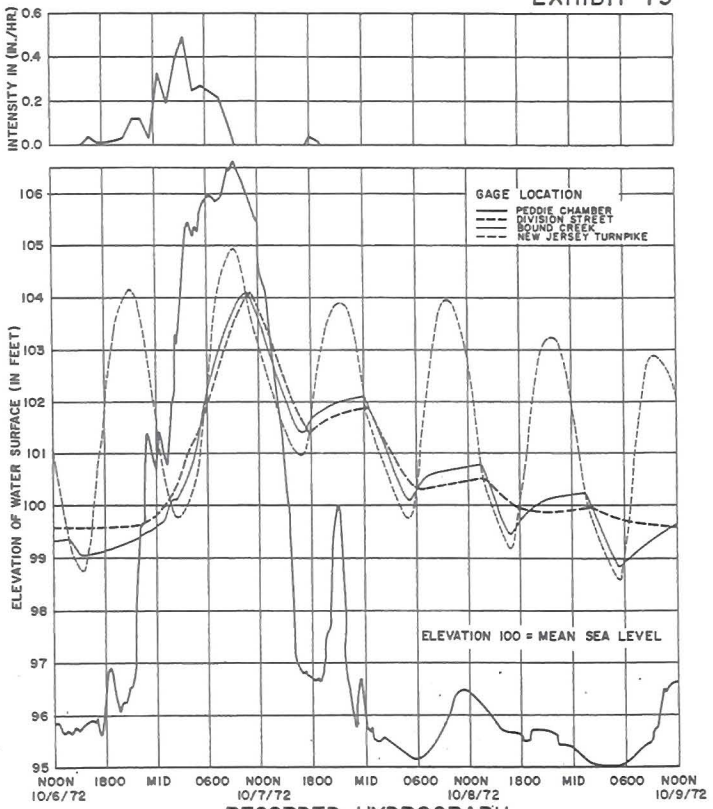
EXHIBIT 79



RECORDED HYDROGRAPH
OCTOBER 6-9, 1972

KLL010645

another major restriction. The Route 1-9 culverts on Peddie Ditch, consisting of five 10' by 10' cells, were constructed in 1970 with an invert elevation of 3.7 and a crown elevation of +6.3. The crown elevation of this culvert is higher than the street grades at Thomas and Jefferson Streets and Meeker Avenue at the Route 22 underpass. These locations are 10,000 and 75000 feet respectively further upstream. With the desired water surface of +0.5 immediately upstream of Route 1-9, less than one half of the culvert area is available. The maximum capacity of these culverts at this flow depth is approximately 1500 c.f.s., only 45% of the peak flow of a one year frequency storm. This points out the great inadequacy of these culverts which was brought about primarily by the lack of a basin master plan and insufficient analysis of the upstream watershed.

It is extremely doubtful that these restrictions can be overcome without a pump station being located upstream of the Route 1-9 culverts. With the pump station at this location, the water can be drawn down to elevation +0.5 on the upstream side and forced through the Route 1-9 culverts at the required gradient. However, locating the pump station at this point will not lower the gradient in the Peripheral Ditch around the airport. High tide levels would then back up water in the Peripheral Ditch to Route 1-9 as it does now. This will greatly exceed the drainage criteria established by the Port of New York Authority for Airport Drainage as they desire to maintain a water surface elevation lower than +2.7 to ensure adequate drainage from the airport. This would not be entirely possible under any of the schemes that we have investigated. The eastern half of the airport, which drains toward the Turnpike would have outlet water surface elevations below +2.7 if the pump station were located adjacent to the Turnpike. However, the western half of the airport would have to drain against outlet water surface elevations in the Peripheral Ditch approximately 5 to 7 feet above sea level. Based on the above anlaysis, it appears to be extremely difficult to meet this genetal criteria of the Port of New York Authority during our 5 year frequency design storm. Only at flow rates of approximately 1500 c.f.s. and less would the water level in the Peripheral Ditch meet their criteria even with a pump station located adjacent to the Turnpike. A more detailed analysis of the PONYA criteria and of the runoff hydrographs will be required to truly evaluate the drainage requiements of the Newark Airport. This detailed analysis is beyond the scope of this report and will be resolved in the final design hydraulics of the pump station. However, it appears that the construction of a storm water pump station adjacent to the New Jersey Turnpike is essential to provide even the normal minimum degree of protection. A pump station at this location will also aid the City of Elizabeth with the drainage from the Alina and Fairmount Districts and the City of Newark on McClellan Street and along Route 1-9.

The City of Newark will benefit most from the construction of a storm water pumping station immediately upstream of Route 1-9. This will eliminate the frequent flooding in the Queen, Peddie, Wheeler and Adams Districts as described in the previous sections of this report. The second pump station, located adjacent to the New Jersey Turnpike, will primarily benefit the Port of New YOrk Authority with some side benefits to the City of Elizabeth, the Route 1-9 drainage system, the McClellan Street underpass, and the industrial areas located between Route 1-9 and the Penn-Central Railroad.

Table VII-24 shows the effect of various tide levels on the water surface profile for the Peripheral Ditch at flows ranging from 1000 to 4000 c.f.s. This is for the improved Peripheral Ditch, with the invert lowered two feet as shown on Exhibit 80, without the construction of the pump station. The profile with a tide level of -2.4 and -0.4 corresponds to a discharge against mean low tide and mean sea level respectively. The profile with a tide level of +3.6 and +7.6 corresponds to a discharge against approximately a monthly high tide and the highest tide of record.

TABLE VII-24

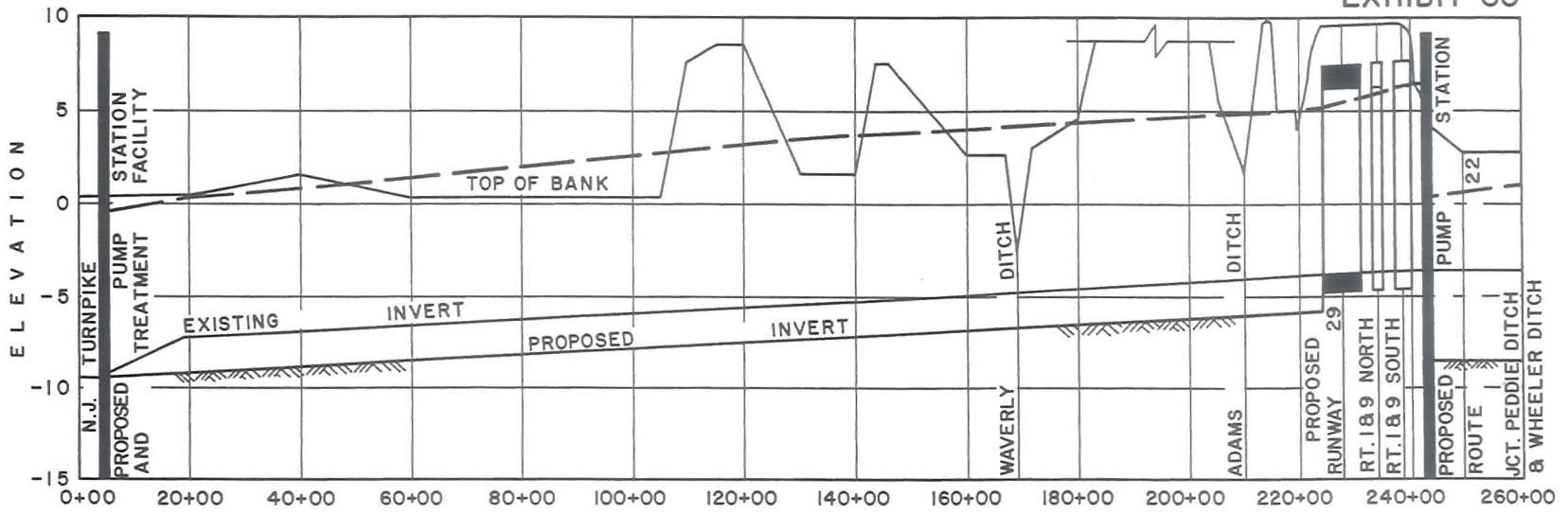
EFFECT OF TIDE LEVEL ON PERIPHERAL DITCH WATER SURFACE PROFILE

	Water Surface Level at Route 1-9 Flow Rate in c.f.s.			
Tide level at Turnpike	1000	2000	3000	4000
-2.4	1.1	3.8	6.3	9.0
-0.4	1.6	4.1	6.5	9.1
+1.6	2.7	4.7	6.9	9.4
+3.6	4.2	5.6	7.6	9.9
+5.6	6.0	7.1	8.7	10.8
+7.6	7.9	8.0	10.1	11.9

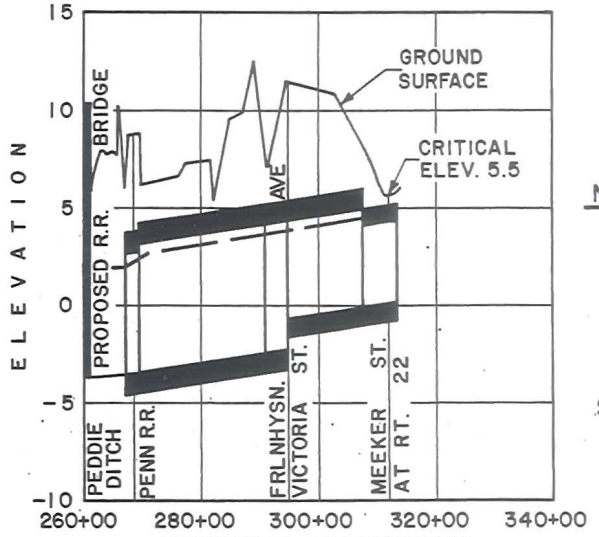
If a pump station were constructed adjacent to the turnpike, the suction level would be maintained at an elevation of approximately -0.4 to +1.6 feet. This would create a surcharge condition in the Peripheral Ditch identical to that shown for these two elevations on Table VII-24.

KLL010646

EXHIBIT 80



PROFILE
PERIPHERAL DITCH

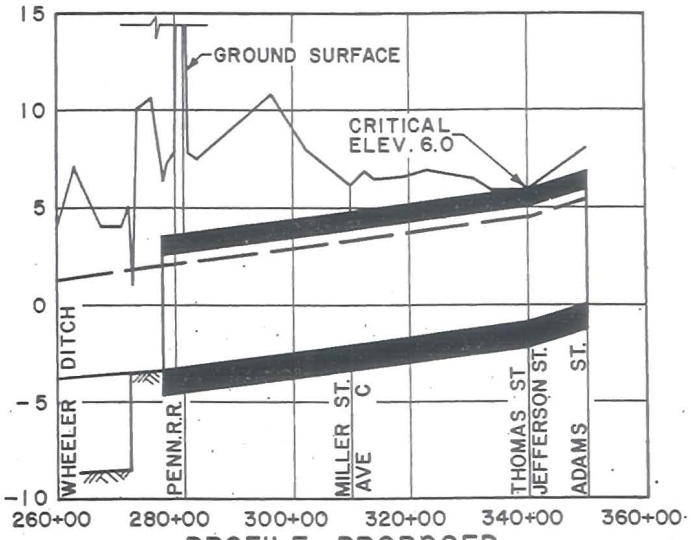


PROFILE PROPOSED
QUEEN DISTRICT CULVERTS

NOTE:

ELEVATION DATUM
0 (ZERO) = MEAN SEA LEVEL
—— EXISTING FACILITIES
—— PROPOSED FACILITIES
– – WATER SURFACE PROFILE
5 YEAR FREQUENCY STORM

SCALE IN FEET
HORIZONTAL 0 500
VERTICAL 0 10



PROFILE PROPOSED
ADAMS DISTRICT CULVERTS

KLL010647

The water surface profile for a 5 year frequency storm, with both pump stations constructed is shown on Exhibit 80. This scheme of double pumping meets all criteria except that of the Port of New York Authority along the western edge of the Airport, which cannot be satisfied by any of the schemes investigated. In addition to the two pump stations a substantial amount of ditch work will also be required. The Peripheral Ditch invert should be lowered two feet to minimize the gradient in the western area of the Airport. This will also minimize the pumping head of the station to be located at Route 1.9. The Peddie, Queen and Wheeler Ditches will also require substantial cleaning and lowering of the invert. The profile of this scheme is shown on Exhibit 80.

Recommended Plan Stage 1

A tremendous amount of construction in the outfall ditch system will be required to provide an adequate outlet for the drainage facilities serving the Queen, Peddie, Wheeler and Adams Districts. The improvement recommended for Queen Ditch has previously been discussed. This improvement is necessary immediately to reduce the frequency of flooding on Meeker and Frelinghuysen Avenues.

The elimination of the obstruction in the Wheeler and Peddie Ditches are also necessary immediately. The 36 inch diameter culvert placed in Wheeler Ditch under an access road must be removed immediately to provide even a minimum degree of protection.

The overall improvements recommended for the Wheeler and Peddie Ditches reflect the summation of all four stages of improvements in the upstream watersheds. The Wheeler Ditch improvement to a trapezoided channel with a 60 foot wide base width and an invert which has been lowered five feet has been sized to discharge the peak flow of 2500 c.f.s. Included in this flow is the improved local drainage from the Wheeler District, the flow diverted from the Adams District and the major diversion of the Peddie District, all of which will not be completed until Stage II. If the Peddie and Wheeler Ditch inverts were lowered as shown on Exhibit 80 much of it would fill back up with silt without the pump station to create reasonable velocities. It is therefore recommended that the Peddie and Wheeler Ditches be improved in stages. During Stage I the channels should be cleaned and widened to the full width proposed for ultimate developments, except in the area of the pump station. The 350 feet of existing sheet pile channel on Peddie Ditch at the junction of Queen Ditch is extremely inadequate and must be replaced during Stage I. However, the widening of the channel for the pump station forebay should not be made at this time because of probable silting problems. A widened trapezoidal channel is recommended as a temporary solution.

The Port of New York Authority is planning to clean the Peripheral Ditch in the near future and it would be ideal to lower the invert at the same time. A major portion of the cost of the Peripheral Ditch improvement should also be born by PONYA. The cost estimate for these facilities is presented on Table VII-25.

Recommended Plan Stage II

The work to be completed during Stage II will be the construction of the storm water pump station adjacent to Route 1-9 and the deepening of the Peddie and Wheeler Ditches. The deepening of the ditches will involve the reach of Peddie Ditch from the pump station back to the junction with Wheeler Ditch. The reach of Peddie Ditch from the junction back to the Peddie outfall cannot be deepended because the elevation of the top of the South Side Interceptor is -3.7, which is the approximate elevation of the existing ditch invert. Because of this railroad bridge and the Peddie Ditch extending back to the outlet will have to be widened to compensate for the shallower depth.

The deepening of the Wheeler Ditch is also controlled by the South Side Interceptor Sewer. The top of the sewer where it crosses Wheeler Ditch is approximately four feet below mean sea level. Upstream of this point, Wheeler Ditch will have to be widened to obtain a water surface elevation of +2.0 at the culvert outlet.

The proposed pump station adjacent to Route 1-9 will draw the storm water from the outlet ditch system and discharge it into the Route 1-9 culverts. The storage volume available in the outlet ditches to reduce the peak flow will be minimal because of the relatively low gradient required at the culvert outlets. It has been estimated that the peak flow from 1 year, 5 year, and 50 year storms will be 3300, 4350, and 6000 c.f.s. respectively at Route 1-9. A design flow in the order of 3000 to 4000 c.f.s. will provide adequate protection in that the peak flow for a 5 year storm will exceed 4000 c.f.s. for approximately 15 minutes and a 50 year frequency flow will exceed it for a period of approximately one and a half hours. If the pump station were designed for 3000 c.f.s. the system would be surcharged for approximately 15 minutes, one hour and three hours for the 1 year, 5 year and 50 year

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storms respectively. A detailed analysis of the differential cost of flood damage between these various flow ranges will be required during final design to make a final selection of the design flow.

Two types of pumps were investigated in the "Newark Meadows Pumping Station" report prepared by James P. Purcell Associates. The general description of each unit and its advantages follows.

The first alternative will utilize Spiralift or Screw Pumps. Each unit would be driven by a motor-operated gear reducer connected to the pumps through flexible couplings. The pump drive has low but constant revolution in the range of 50 r.p.m. The pump would operate with various depths of water in the ditch increasing the discharge rate to a maximum as the inlet water level rises to 75% submergence of the bottom end of the torque tube. The lower end of the torque tube rests on a pressurized enclosed bearing and the upper section is supported on a thrust bearing. Mechanically this is very simple, which will minimize operation and repair costs.

The previous layout of the pump station utilized nine 12 foot diameter pumps with a maximum discharge capacity of 90,000 gallons per minute at 75% efficiency and is shown on Exhibit 81. The expansion of the station to meet the new design flow will probably require a doubling of the pump station size since the 12 foot diameter pump is the largest size spiral pump that is readily available.

This type pump is ideal for flood control, sewage treatment plant and industrial installation. It has the advantage of being flexible in operation; it will work at maximum efficiency with variable water levels in the sump.

Because of its unique structure, pump house requirements will be very simple. This pump may not need an intricate protection of fine screening to remove suspended or floating materials that can damage other pumps. Debris can pass the pump without any adverse effect. However, to avoid transporting large and unsightly debris to Newark Bay, trash racks with openings of 3" to 4" would be provided. The pumps have a maximum efficiency of 75% operating at 60% to 100% of discharge capacity.

The second alternative will utilize axial flow propeller type pumps. Each pump would be driven by either a direct coupled vertical or a right angle drive coupled horizontal electric motor. Each pump will be 72 inches in diameter with two units having a capacity of approximately 225 c.f.s. and either 7 or 9 units, depending upon the design flow, having approximately 450 c.f.s. capacity. A major advantage of the axial flow pumps is that the pump capacity can be increased by changing only the motor and pump impeller. This change will not affect the hydraulic or structural requirements, except for floor loadings. Exhibit 82 presents the previous plan of the pump station with eight 72 inch diameter 225 c.f.s. capacity pumps driven by electric motors directly connected to the vertical shaft pumps. Increasing the capacity of the pumps to 450 c.f.s. will only require larger motors and pump impellers, and the building size will have to be increased only slightly.

This system is ideal for pumping clear or storm water, and its maximum operating efficiency can reach as high as 89% at maximum capacity. Hence, these pumps have low operating cost. Due to the mechanics of this type operation, the system requires a deep sump to avoid cavitation of the pump. Bar screens would also be required to eliminate damage to the pumps and assure maximum efficiency.

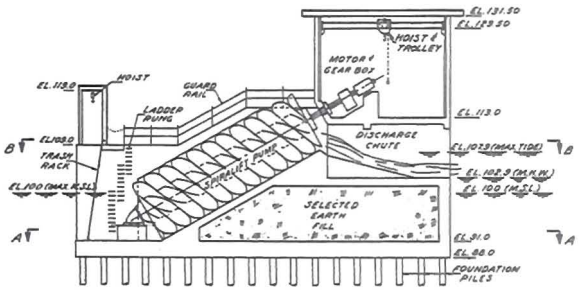
The presence of high capacity Public Service power lines in the Elizabeth Port, the Airport, and Frelinghuysen Avenue areas makes the selection of the electric motor drive the best for either type of pump. The use of electric power rather than gas or diesel driven generators is of significant value from an air pollution control aspect, as well as cost. Conferences with officials of the power company in connection with providing electric power to the station have explored the feasibility of obtaining 13 KV service. The power company officials have given assurance that they can provide free of charge a single circuit supply line from their power loop with probable restoration in case of power failure within 4 hours. An auxiliary power line can also be obtained at additional cost to the City with power restoration of a few seconds in case of failure. The final selection of the type of pumps to be used and the pumping station capacity will be determined in final design. A mean value pump station cost of $5,400,000 has been used in Table VII-25. This should be sufficient to provide a pump station of 4000 c.f.s. capacity.

Recommended Plan Stage III and IV

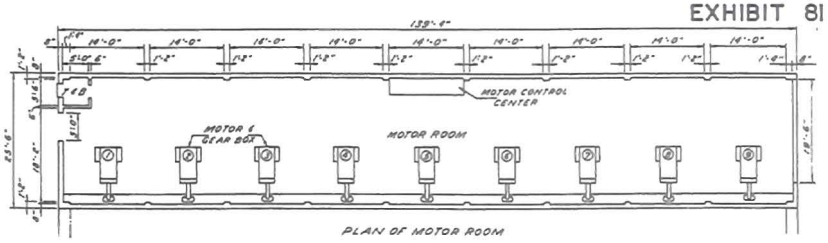
Stage III and IV construction in this area will consist primarily of the construction of the combined sewage treatment facility as discussed in detail in Chapter VIII.

KLLC10649

EXHIBIT 81



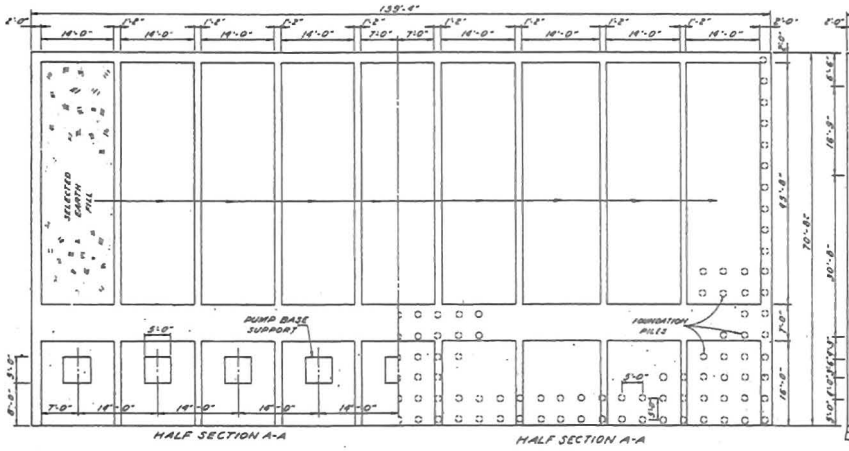
TRANSVERSE SECTION



PLAN OF MOTOR ROOM

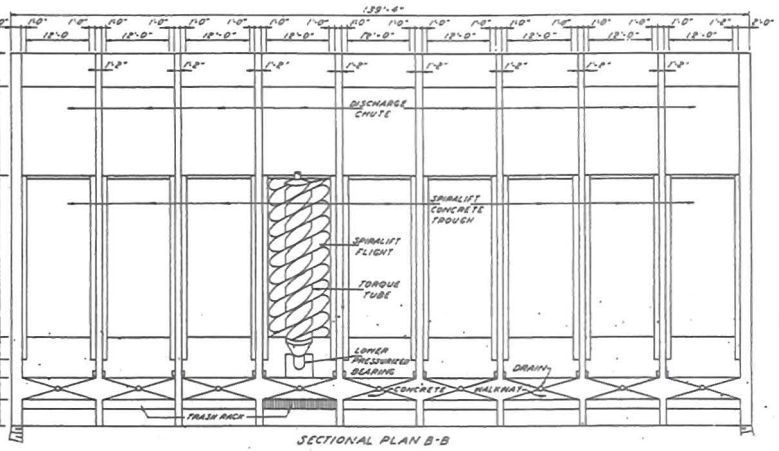
NOTE:

ELEVATION 100.0 = MEAN SEA LEVEL



HALF SECTION A-A

HALF SECTION A-A

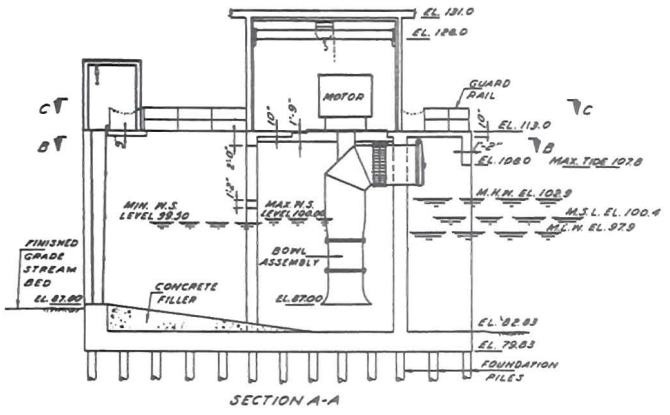


SECTIONAL PLAN B-B

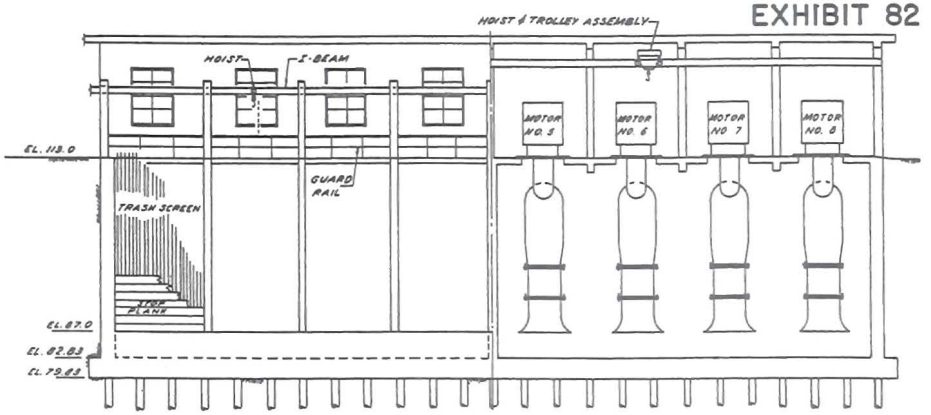
PLANT LAYOUT SPIRALIFT PUMP

KLL010650

EXHIBIT 82



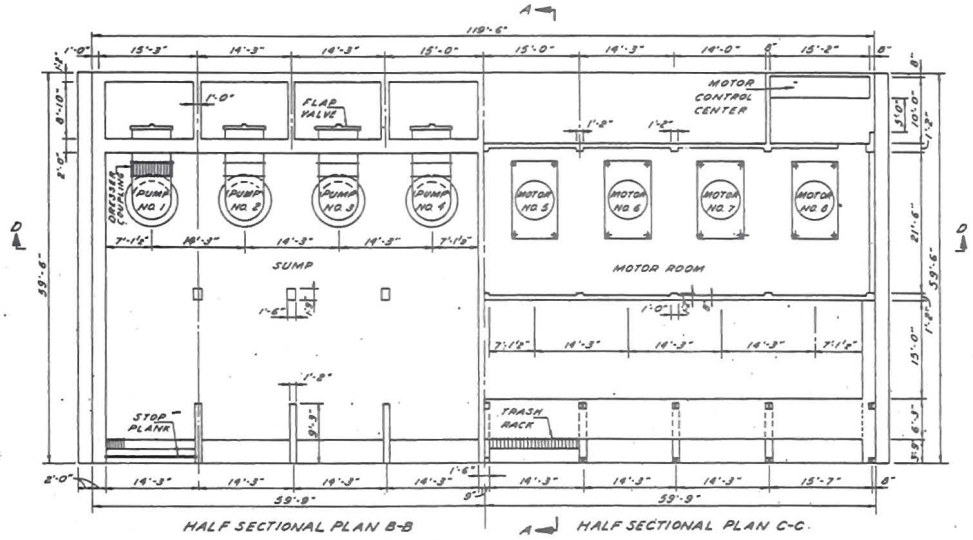
SECTION A-A



HALF ELEVATION

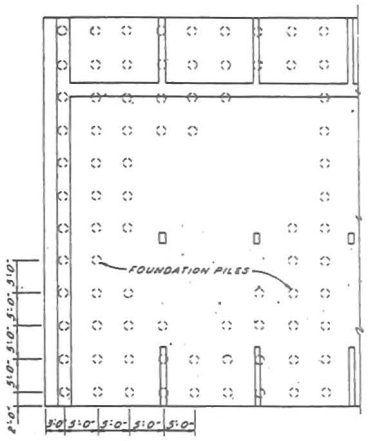
HALF SECTION D-D

NOTE:
ELEVATION 100.0 = MEAN SEA LEVEL



HALF SECTIONAL PLAN B-B

HALF SECTIONAL PLAN C-C

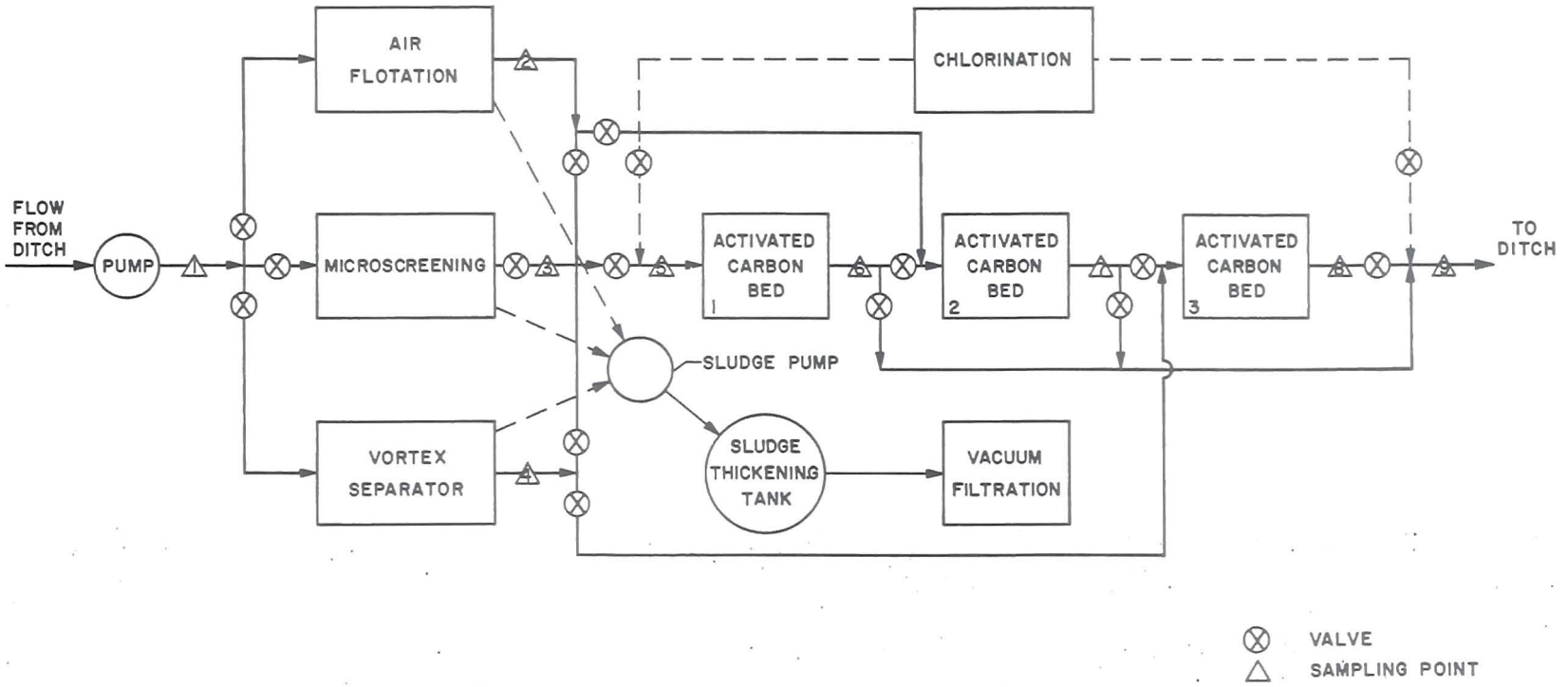


FOUNDATION PILE PLAN

PLANT LAYOUT PROPELLER PUMP

KLL010651

EXHIBIT 83



PILOT PLANT SCHEMATIC
COMBINED SEWAGE OVERLOW TREATMENT FACILITY

KLL010652

TABLE VII-25

OUTFALL DITCHES COST ESTIMATE

		Cost
Stage 1		
Queen Ditch (See Queen District)		-
Wheeler and Peddie Ditch		500,000
Peripheral Ditch cleaning		840,000
	Sub-Total	**$1,340,000**
Stage II		
Route 1-9 Pump Station		5,400,000
Stage III and IV		
Turnpike Pump Station		5,400,000
	Total	**$11,140,000**

Although the Bay and Vailsburg Districts are outside the immediate study area, existing facilities in these areas have been inventoried in connection with our overall study. The existing sewers and utilities in the Bay District are shown on Exhibits 84, 85, and 86. The existing sewers and utilities in the Valisburg District are shown on Exhibits 87, 88, and 89.

KLLC10653

Carpenter Technology Corp. (Union)

ID 40237
CM 2019
20 Copy to Atkins

State of New Jersey
Department of Environmental Protection

Return forms to:
INDUSTRIAL SURVEY PROJECT
P.O. BOX 251
TRENTON, NEW JERSEY 08602

OFFICE OF THE COMMISSIONER

SELECTED SUBSTANCE REPORT

SELSUB 022 0611

PART I – General Plant Information

COMPLETE ONE REPORT FOR EACH PLANT SITE OR FACILITY LOCATION

1. Company Name CARPENTER TECHNOLOGY CORPORATION
2. Division or Plant Name TUBE DIVISION
3. Mailing Address (Street) 133 SPRINGFIELD ROAD
   (City/Town) UNION County UNION State N.J. Zip Code 07083
4. Plant Location Address (Street) AS ABOVE
   (If not as above)
   (City/Town) County State Zip Code
5. Date Plant Began Operations At This Location 7/1/47
6. Person to Contact Regarding this Report L. REINA Title
7. Phone Number (Area Code) (201) 686-7230
8. SIC Code (Four Digit) 3317 Standard Industrial Classification (if available)
9. Nature of Business MFG. OF STAINLESS STEEL PIPE AND TUBING
10. Number of Production Employees at this Plant Site 220
11. Does this plant manufacture, process, form, repackage, release, use, dispose of or store any of the selected substances shown on Table I of the enclosed instructions? (Check One) YES [X] NO [ ]

    If your answer to number 11 is "YES", complete the Entire Report for your facility, sign and return.

    If your answer to number 11 is "NO", complete Question 15, sign and return.

I, HEREBY, CERTIFY THAT ALL STATEMENTS MADE BY ME IN THIS REPORT ARE TRUE, COMPLETE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT ESTIMATES WHERE USED HAVE BEEN MADE IN GOOD FAITH.

NAME (Print) LAWRENCE REINA Signature Lawrence Reina

Title Sr. Electrical Engr. Date 12/30/80

12A. Sketch (On the reverse side of this page) or attach a copy of a map indicating the exact location of the plant site.

12B. Supply your Dun & Bradstreet number if available. 00-234-4315

FOR OFFICIAL USE ONLY

E	S 3317	N	
B	O 1978	A 2	
C 0		X	
V		D&B 002344315	

216457000 | 284 141 3317
CARPENTER TECHNOLOGY
CORPORATION DEL
101 W BERN ST
READING PA 19603

UNION TWP NJ 30732

SELSUB 022 0612

FOR DEP USE ONLY

PART I – General Information (continued)

13. List all of the selected substances included in this report along with their CAS Numbers (From Table I of the Instructions) which are manufactured, processed, formed, repackaged, released, used, disposed of or stored at the plant site:

79-01-6 TRICHLOROETHYLENE

40237

14. Wastewater Discharges – Complete the following information:

A. Discharge to publicly owned treatment works (POTW):

1. Name of Utility (POTW) JOINT MEETING SEWAGE DISPOSAL COMMISSION

00024741

Address/Location ELIZABETH, N.J.

2. Estimated Average Volume of Wastewater Discharged to POTW in a day

210,000 gallons.

2 000, 0400

3. Briefly describe any pretreatment methods NONE

399

4. Wastewater consists of: ( ) Process Water, (X) Contact Cooling, (X) Non-Contact Cooling, (X) Domestic Sewage, ( ) Contaminated Storm Water, ( ) Washdown Water, (X) Scrubber Water, ( ) Other;

B. Discharge to Navigable Waterway or Tributary Stream:

1. Name of Receiving Stream NONE

2. NPDES Permit Number

3. Estimated average volume of wastewater discharged to receiving stream in a day

gallons.

4. Briefly describe any treatment methods

5. Wastewater consists of: ( ) Process Water, ( ) Contact Cooling, ( ) Non-Contact Cooling, ( ) Domestic Sewage, ( ) Contaminated Storm Water, ( ) Washdown Water, ( ) Scrubber Water, ( ) Other;

15. Previous disposal practices (1930–1977). Has this plant previously disposed of wastes containing any of the selected substances at any land disposal site (i.e. by land spreading or burial, landfilling, lagoon or seepage pit) either on or off site?

YES ☐ NO ☒ 02 10/9

If available provide the following information for each disposal site. Use additional pages if necessary.

Name and Location of Site

Time period site was used

Name of selected substances disposed of at this site	Physical State	Amount of selected substance disposed at site (pounds)

Department of Environmental Protection

PART II SELECTED SUBSTANCE REPORT

COMPLETE ONE FORM FOR EACH SELECTED SUBSTANCE

FOR DEP USE

1. Name and Location of Plant
CARPENTER TECHNOLOGY CORPORATION

SELSUB 022 0613

I.D. 40237

2. Selected Substance Name
TRICHLOROETHYLENE

CAS # 79-01-6 | 01 | 79 | 01 | 6

3. Briefly Describe Its Use On The Site:
IMMERSION OF BUNDLES OF STAINLESS STEEL TUBES TO REMOVE LUBRICANT DRAWING COATING.

S-98

	COMPLETE THE FOLLOWING INFORMATION FOR THE PLANT BASED ON 1978 USAGE	ENTER THE ACTUAL OR ESTIMATED AMOUNTS	USE THE REQUESTED UNITS	CHECK ONE: ACTUAL	CHECK ONE: ESTIMATE
THROUGH-PUT QUANTITIES	4. QUANTITY PRODUCED ON SITE	(3300 gal) 38,571	lbs/yr.		X
	5. QUANTITY BROUGHT ONTO SITE	(42,325 gal) 490,970	lbs/yr.		X
	6. QUANTITY CONSUMED ON SITE	~~NONE~~ 0	lbs/yr.		X
	7. QUANTITY SHIPPED OFF SITE AS (OR IN) PRODUCT	~~NONE~~ 0	lbs/yr.		X
	8. MAXIMUM INVENTORY	(6,800 gal) 79,424	lbs	X	
AIR EMISSIONS	9. TOTAL STACK EMISSIONS OF SELECTED SUBSTANCE	280,000	lbs/yr.		X
		2,808	max lbs/day		X
	10. TOTAL FUGITIVE EMISSIONS OF SELECTED SUBSTANCE	85,000	lbs/yr.		X
		8,500	max lbs/day		X
WASTEWATER DISCHARGE	11. TOTAL DISCHARGE OF SELECTED SUBSTANCE INTO SURFACE WATER	~~NONE~~ 0	lbs/yr.		X
		0	max lbs/day		X
	12. TOTAL DISCHARGE OF SELECTED SUBSTANCE INTO PUBLICLY OWNED TREATMENT WORKS	~~NONE~~ 0	lbs/yr.		X
		0	max lbs/day		X

13. DISPOSAL OF WASTE CONTAINING THE SELECTED SUBSTANCE

	LOCATION OF FINAL DISPOSAL SITE NAME AND ADDRESS	PHYSICAL STATE TABLE A	DISPOSAL METHOD TABLE B	QUANTITY OF SELECTED SUBSTANCE DISPOSED (lbs)	FOR DEP USE
1.	MARISOL, INC. 125 FACTORY LANE MIDDLESEX, N.J.	W04	M-11	26,000	1211B
2.					
3.					
4.					
5.					

TABLE A
PHYSICAL STATE

W-01 Solid
W-02 Liquid
W-03 Slurry
W-04 Sludge
W-09 Other (specify)

TABLE B
DISPOSAL METHODS

M-01 Composting
M-02 Evaporation
M-03 Holding Tank
M-04 Incineration
M-05 Injection Well
M-06 Lagoon
M-07 Land Burial
M-08 Land Spreading
M-09 Neutralization
M-10 Ocean
M-11 Recycling
M-12 Sanitary Landfill
M-13 Surface Water
M-14 Subsurface System
M-15 Pyrolysis
M-16 Spray Irrigation
M-17 Stored On Site
M-98 Other (specify)

FOR DEP USE ONLY

PART I — General Information (continued)

SELSUB 022 0614

13. List all of the selected substances included in this report along with their CAS Numbers (From Table I of the Instructions) which are manufactured, processed, formed, repackaged, released, used, disposed of or stored at the plant site:

NOTE: UPDATED INFORMATION IN QUESTION 14 BELOW

5/8/91

14. Wastewater Discharges — Complete the following information:

A. Discharge to publicly owned treatment works (POTW):

1. Name of Utility (POTW) _____

Address/Location _____

2. Estimated Average Volume of Wastewater Discharged to POTW in a day

240,000 gallons.

3. Briefly describe any pretreatment methods _____

4. Wastewater consists of: ( ) Process Water, ( ) Contact Cooling, ( ) Non-Contact Cooling, ( ) Domestic Sewage, ( ) Contaminated Storm Water, ( ) Washdown Water, ( ) Scrubber Water, (X) Other: ~~Final tube rinse water from~~ pickling process

B. Discharge to Navigable Waterway or Tributary Stream:

1. Name of Receiving Stream _____

2. NPDES Permit Number _____

3. Estimated average volume of wastewater discharged to receiving stream in a day

_____ gallons.

4. Briefly describe any treatment methods _____

5. Wastewater consists of: ( ) Process Water, ( ) Contact Cooling, ( ) Non-Contact Cooling, ( ) Domestic Sewage, ( ) Contaminated Storm Water, ( ) Washdown Water, ( ) Scrubber Water, ( ) Other: _____

15. Previous disposal practices (1930–1977). Has this plant previously disposed of wastes containing any of the selected substances at any land disposal site (i.e. by land spreading or burial, landfilling, lagoon or seepage pit) either on or off site?

YES ☐ NO ☐

If available provide the following information for each disposal site. Use additional pages if necessary.

Name and Location of Site _____

Time period site was used _____

Name of selected substances disposed of at this site	Physical State	Amount of selected substance disposed at site (pounds)

Form COM 021 A
Rev 2/80

SELSUB 022 0615

ID 40237

CM 2019

20

State of New Jersey
Department of Environmental Protection

Return forms to:
INDUSTRIAL SURVEY PROJECT
P.O. BOX 251
TRENTON, NEW JERSEY 08602

OFFICE OF THE COMMISSIONER

SELECTED SUBSTANCE REPORT

PART I – General Plant Information

COMPLETE ONE REPORT FOR EACH PLANT SITE OR FACILITY LOCATION

1. Company Name CARPENTER [illegible]
2. Division or Plant Name [illegible]
3. Mailing Address (Street) 133 [illegible]
   (City/Town) [illegible] County [illegible] State N.J. Zip Code 07083
4. Plant Location Address (Street) [illegible]
   (If not as above)
   (City/Town) [illegible] County [illegible] State [illegible] Zip Code [illegible]
5. Date Plant Began Operations At This Location [illegible]7
6. Person to Contact Regarding this Report [illegible] Title [illegible]
7. Phone Number (Area Code) ([illegible]) [illegible]-7330
8. SIC Code (Four Digit) 3317 Standard Industrial Classification (if available)
9. Nature of Business [illegible]
10. Number of Production Employees at this Plant Site [illegible]20
11. Does this plant manufacture, process, form, repackage, release, use, dispose of or store any of the selected substances shown on Table I of the enclosed instructions? (Check One) YES [X] NO [ ]

    If your answer to number 11 is "YES", complete the Entire Report for your facility, sign and return.

    If your answer to number 11 is "NO", complete Question 15, sign and return.

I, HEREBY, CERTIFY THAT ALL STATEMENTS MADE BY ME IN THIS REPORT ARE TRUE, COMPLETE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT ESTIMATES WHERE USED HAVE BEEN MADE IN GOOD FAITH.

NAME (Print) LAWRENCE [illegible] Signature [illegible]

Title Sr. Electrical Engr. Date 12/30/80

12A. Sketch (On the reverse side of this page) or attach a copy of a map indicating the exact location of the plant site.

12B. Supply your Dun & Bradstreet number if available. 00-234-1315

FOR OFFICIAL USE ONLY

E 5592
B 502
C 0
V 2
M 1

S 3317
O 1978

N 45048
A 2
X
D&B 002203438

216457000 (284 141 3317
CARPENTER TECHNOLOGY
CORPORATION DEL
101 W BERN ST
READING PA 19603

UNION TWP NJ 30732

FOR DEP USE ONLY

40237

PART I – General Information (continued)

13. List all of the selected substances included in this report along with their CAS Numbers (From Table I of the Instructions) which are manufactured, processed, formed, repackaged, released, used, disposed of or stored at the plant site:

79-01-6 TRICHLOROETHYLENE

14. Wastewater Discharges – Complete the following information:

A. Discharge to publicly owned treatment works (POTW):

1. Name of Utility (POTW) [illegible] 1. 24741

Address/Location [illegible]

2. Estimated Average Volume of Wastewater Discharged to POTW in a day

40,000 gallons. 2. 000.0400

3. Briefly describe any pretreatment methods NONE 3. 99

4. Wastewater consists of: ( ) Process Water, ( ) Contact Cooling, ( ) Non-Contact Cooling, (X) Domestic Sewage, ( ) Contaminated Storm Water, ( ) Washdown Water, (X) Scrubber Water, ( ) Other;

B. Discharge to Navigable Waterway or Tributary Stream:

1. Name of Receiving Stream NONE

2. NPDES Permit Number

3. Estimated average volume of wastewater discharged to receiving stream in a day

gallons.

4. Briefly describe any treatment methods

5. Wastewater consists of: ( ) Process Water, ( ) Contact Cooling, ( ) Non-Contact Cooling, ( ) Domestic Sewage, ( ) Contaminated Storm Water, ( ) Washdown Water, ( ) Scrubber Water, ( ) Other;

15. Previous disposal practices (1930–1977). Has this plant previously disposed of wastes containing any of the selected substances at any land disposal site (i.e. by land spreading or burial, landfilling, lagoon or seepage pit) either on or off site?

YES [ ] NO [ ] 02 00

If available provide the following information for each disposal site. Use additional pages if necessary.

Name and Location of Site

Time period site was used

Name of selected substances disposed of at this site	Physical State	Amount of selected substance disposed at site (pounds)

orm COM-021 B
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page ____ of ____

State of New Jersey
Department of Environmental Protection

ART II

SELECTED SUBSTANCE REPORT SELSUB 022 0617

OMPLETE ONE FORM FOR EACH SELECTED SUBSTANCE

FOR DEP USE

Name and Location of Plant	I.D.
CARPENTER T[illegible]NOL[illegible]	40237

Selected Substance Name	CAS #			
T[illegible]ICHLOROETHYLENE	[illegible]-01-6	01	79	01 6

Briefly Describe Its Use On The Site:

IMMERSION OF BUNDLES [illegible] TO REMOVE LUB[illegible]ICANT D[illegible] [illegible] COATING.

S-11

	COMPLETE THE FOLLOWING INFORMATION FOR THE PLANT BASED ON 1978 USAGE	ENTER THE ACTUAL OR ESTIMATED AMOUNTS	USE THE REQUESTED UNITS	CHECK ONE ACTUAL	CHECK ONE ESTIMATED
QUANTITIES	4. QUANTITY PRODUCED ON SITE	([illegible]) [illegible]	lbs/yr.		X
	5. QUANTITY BROUGHT ONTO SITE	([illegible]) [illegible]	lbs/yr.		X
	6. QUANTITY CONSUMED ON SITE	un -0-	lbs/yr.		
	7. QUANTITY SHIPPED OFF SITE AS (OR IN) PRODUCT	u -0-	lbs/yr.		
	8. MAXIMUM INVENTORY	([illegible]) [illegible]	lbs	X	
EMISSIONS	9. TOTAL STACK EMISSIONS OF SELECTED SUBSTANCE	[illegible]	lbs/yr.		X
		[illegible]	max lbs/day		X
	10. TOTAL FUGITIVE EMISSIONS OF SELECTED SUBSTANCE	[illegible],000	lbs/yr.		X
		[illegible],500	max lbs/day		X
DISCHARGE	11. TOTAL DISCHARGE OF SELECTED SUBSTANCE INTO SURFACE WATER	~~NONE~~ -0-	lbs/yr.		
			max lbs/day		
	12. TOTAL DISCHARGE OF SELECTED SUBSTANCE INTO PUBLICLY OWNED TREATMENT WORKS	~~NONE~~ -0-	lbs/yr.		
			max lbs/day		

3. DISPOSAL OF WASTE CONTAINING THE SELECTED SUBSTANCE

LOCATION OF FINAL DISPOSAL SITE NAME AND ADDRESS	PHYSICAL STATE TABLE A	DISPOSAL METHOD TABLE B	QUANTITY OF SELECTED SUBSTANCE DISPOSED (lbs)	FOR DEP USE
[illegible]OL, [illegible]. 125 [illegible] MIDDLE[illegible], N.J.	[illegible]4	[illegible]-11	[illegible],[illegible]0	1211B

TABLE A
PHYSICAL STATE

W-01 Solid
W-02 Liquid
W-03 Slurry
W-04 Sludge
W-09 Other (specify)

TABLE B
DISPOSAL METHODS

M-01 Composting
M-02 Evaporation
M-03 Holding Tank
M-04 Incineration
M-05 Injection Well
M-06 Lagoon
M-07 Land Burial
M-08 Land Spreading
M-09 Neutralization
M-10 Ocean
M-11 Recycling
M-12 Sanitary Landfill
M-13 Surface Water
M-14 Subsurface System
M-15 Pyrolysis
M-16 Spray Irrigation
M-17 Stored On Site
M-98 Other (specify)

CARPENTER TECHNOLOGY CORPORATION
TUBE DIVISION SPRINGFIELD ROAD, UNION, NEW JERSEY 07083 (201) 886-7230

May 8, 1981

Industrial Survey Project
P.O. Box 251
Trenton, N.J. 08602

Att: Cindy Scott

Dear Ms. Scott:

As per our telephone conversation on Friday, May 8, 1981, I am enclosing a copy of Selected Substances Report originally completed and submitted on 12/30/80.

Also, as you suggested, I have attached new page 2 of Part I containing updated information in question 14.

Also, duplicate forms received 4/30/81 are being returned as received.

Very truly yours,

Lawrence Reina
Sr. Electrical Engineer

LR/lu
encl.

Form COM-021 A
Rev. 2/80

SELSUB 022 0619

ID

CM

State of New Jersey
Department of Environmental Protection

Return forms to:
INDUSTRIAL SURVEY PROJECT
P.O. BOX 251
TRENTON, NEW JERSEY 08602

OFFICE OF THE COMMISSIONER

SELECTED SUBSTANCE REPORT

PART I – General Plant Information

COMPLETE ONE REPORT FOR EACH PLANT SITE OR FACILITY LOCATION

1. Company Name CARPENTER TECHNOLOGY CORPORATION
2. Division or Plant Name TUBE DIVISION
3. Mailing Address (Street) 133 SPRINGFIELD ROAD
   (City/Town) UNION County UNION State N.J. Zip Code 07083
4. Plant Location Address (Street) AS ABOVE
   (If not as above)
   (City/Town) County State Zip Code
5. Date Plant Began Operations At This Location 7/1/47
6. Person to Contact Regarding this Report L. REINA Title
7. Phone Number (Area Code) (201) 686-7230
8. SIC Code (Four Digit) 3317 Standard Industrial Classification (if available)
9. Nature of Business MFG. OF STAINLESS STEEL PIPE AND TUBING
10. Number of Production Employees at this Plant Site 220
11. Does this plant manufacture, process, form, repackage, release, use, dispose of or store any of the selected substances shown on Table I of the enclosed instructions? (Check One) YES [X] NO [ ]

    If your answer to number 11 is "YES", complete the Entire Report for your facility, sign and return.

    If your answer to number 11 is "NO", complete Question 15, sign and return.

I, HEREBY, CERTIFY THAT ALL STATEMENTS MADE BY ME IN THIS REPORT ARE TRUE, COMPLETE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT ESTIMATES WHERE USED HAVE BEEN MADE IN GOOD FAITH.

NAME (Print) LAWRENCE REINA Signature Lawrence Reina

Title Sr. Electrical Engr. Date 12/30/80

12A. Sketch (On the reverse side of this page) or attach a copy of a map indicating the exact location of the plant site.

12B. Supply your Dun & Bradstreet number if available. 00-234-4315

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E S N
B O A
C X
V D&B

21645700 001 284 141 3317
CARPENTER TECHNOLOGY
CORPORATION DEL
101 W BERN ST
READING PA 19603

UNION TWP NJ 30732

FOR DEP USE ONLY

PART I – General Information (continued)

13. List all of the selected substances included in this report along with their CAS Numbers (From Table I of the instructions) which are manufactured, processed, formed, repackaged, released, used, disposed of or stored at the plant site:

79-01-6 TRICHLOROETHYLENE

14. Wastewater Discharges – Complete the following information:

A. Discharge to publicly owned treatment works (POTW):

1. Name of Utility (POTW) JOINT MEETING SEWAGE DISPOSAL COMMISSION

Address/Location ELIZABETH, N.J.

2. Estimated Average Volume of Wastewater Discharged to POTW in a day

40,000 gallons.

3. Briefly describe any pretreatment methods NONE

4. Wastewater consists of: ( ) Process Water, (X) Contact Cooling, (X) Non-Contact Cooling, (X) Domestic Sewage, ( ) Contaminated Storm Water, ( ) Washdown Water, (X) Scrubber Water, ( ) Other;

B. Discharge to Navigable Waterway or Tributary Stream:

1. Name of Receiving Stream NONE

2. NPDES Permit Number

3. Estimated average volume of wastewater discharged to receiving stream in a day

gallons.

4. Briefly describe any treatment methods

5. Wastewater consists of: ( ) Process Water, ( ) Contact Cooling, ( ) Non-Contact Cooling, ( ) Domestic Sewage, ( ) Contaminated Storm Water, ( ) Washdown Water, ( ) Scrubber Water, ( ) Other;

15. Previous disposal practices (1930–1977). Has this plant previously disposed of wastes containing any of the selected substances at any land disposal site (i.e. by land spreading or burial, landfilling, lagoon or seepage pit) either on or off site?

YES ☐ NO ☒

If available provide the following information for each disposal site. Use additional pages if necessary.

Name and Location of Site

Time period site was used

Name of selected substances disposed of at this site	Physical State	Amount of selected substance disposed at site (pounds)

Form COM-021 B
Rev. 2/80

State of New Jersey
Department of Environmental Protection

page ____ of ____

Let's protect our earth

PART II

SELECTED SUBSTANCE REPORT

SELSUB 022 0621

FOR DEP USE

COMPLETE ONE FORM FOR EACH SELECTED SUBSTANCE

1. Name and Location of Plant
CARPENTER TECHNOLOGY CORPORATION

I.D.

2. Selected Substance Name
TRICHLOROETHYLENE

CAS #
79-01-6

3. Briefly Describe Its Use On The Site:
IMMERSION OF BUNDLES OF STAINLESS STEEL TUBES TO REMOVE LUBRICANT DRAWING COATING.

	COMPLETE THE FOLLOWING INFORMATION FOR THE PLANT BASED ON 1978 USAGE	ENTER THE ACTUAL OR ESTIMATED AMOUNTS	USE THE REQUESTED UNITS	CHECK ONE: ACTUAL	CHECK ONE: ESTIMATED
THROUGH-PUT QUANTITIES	4. QUANTITY PRODUCED ON SITE	(3300 gal) 38,571	lbs/yr.		X
	5. QUANTITY BROUGHT ONTO SITE	(42,325 gal) 490,970	lbs/yr.		X
	6. QUANTITY CONSUMED ON SITE	NONE	lbs/yr.		
	7. QUANTITY SHIPPED OFF SITE AS (OR IN) PRODUCT	NONE	lbs/yr.		
	8. MAXIMUM INVENTORY	(6,800 gal) 79,424	lbs	X	
AIR EMISSIONS	9. TOTAL STACK EMISSIONS OF SELECTED SUBSTANCE	280,000	lbs/yr.		X
		2,808	max lbs/day		X
	10. TOTAL FUGITIVE EMISSIONS OF SELECTED SUBSTANCE	85,000	lbs/yr.		X
		8,500	max lbs/day		X
WASTEWATER DISCHARGE	11. TOTAL DISCHARGE OF SELECTED SUBSTANCE INTO SURFACE WATER	NONE	lbs/yr.		
			max lbs/day		
	12. TOTAL DISCHARGE OF SELECTED SUBSTANCE INTO PUBLICLY OWNED TREATMENT WORKS	NONE	lbs/yr.		
			max lbs/day		

13. DISPOSAL OF WASTE CONTAINING THE SELECTED SUBSTANCE

LOCATION OF FINAL DISPOSAL SITE NAME AND ADDRESS	PHYSICAL STATE TABLE A	DISPOSAL METHOD TABLE B	QUANTITY OF SELECTED SUBSTANCE DISPOSED (lbs)	FOR DEP USE
1. MARISOL, INC. 125 FACTORY LANE MIDDLESEX, N.J.	W04	M-11	26,000	
2.				
3.				
4.				
5.				

TABLE A PHYSICAL STATE

W-01 Solid
W-02 Liquid
W-03 Slurry
W-04 Sludge
W-09 Other (specify)

TABLE B DISPOSAL METHODS

M-01 Composting
M-02 Evaporation
M-03 Holding Tank
M-04 Incineration
M-05 Injection Well
M-06 Lagoon
M-07 Land Burial
M-08 Land Spreading
M-09 Neutralization
M-10 Ocean
M-11 Recycling
M-12 Sanitary Landfill
M-13 Surface Water
M-14 Subsurface System
M-15 Pyrolysis
M-16 Spray Irrigation
M-17 Stored On Site
M-98 Other (specify)

EXHIBIT 84

EXISTING SEWERS
BAY DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

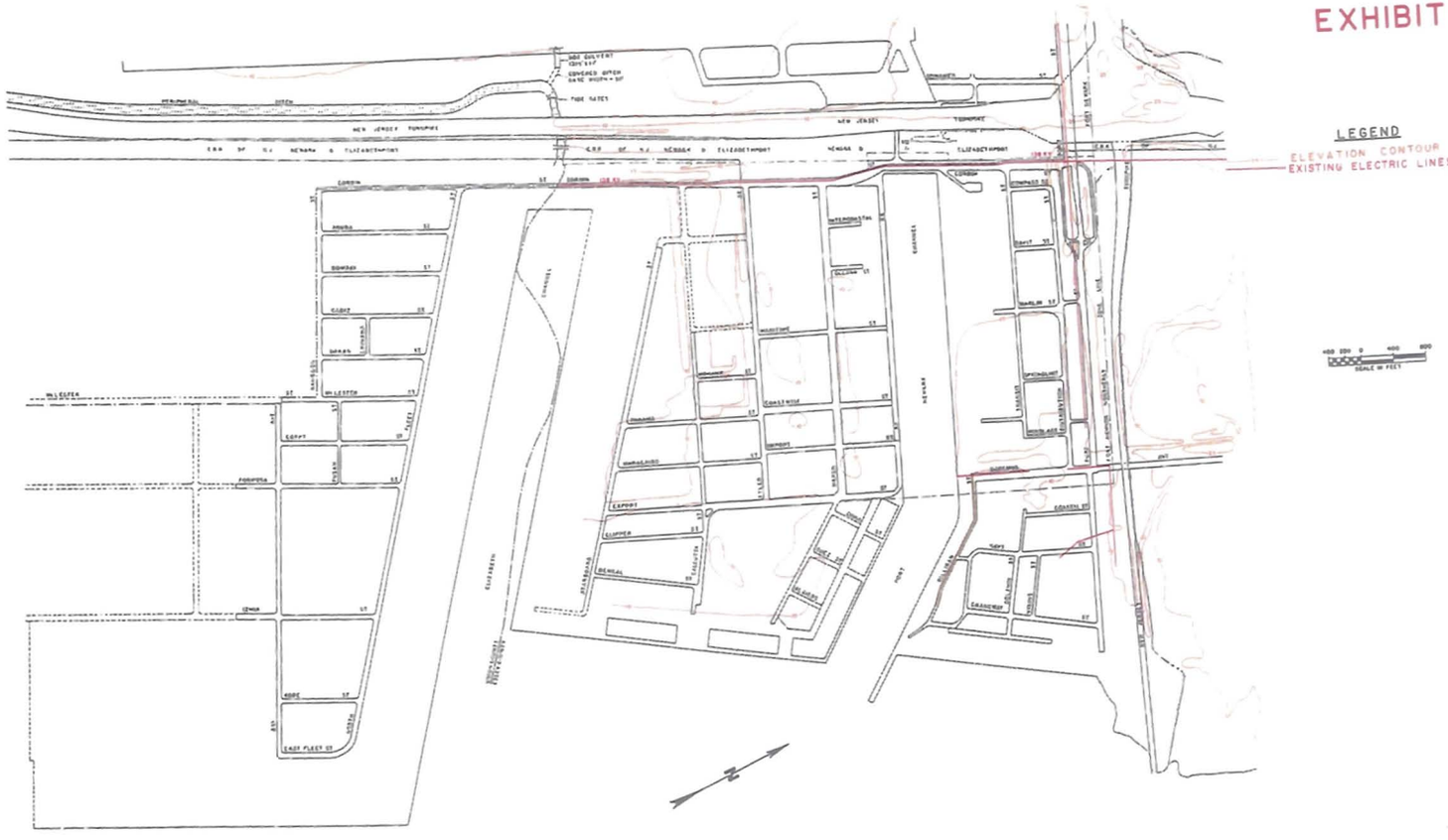
KLL010654

EXHIBIT 85

EXISTING UTILITIES
BAY DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010655

EXHIBIT 86



EXISTING UTILITIES
BAY DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010656

EXHIBIT 87

LEGEND

- ELEVATION CONTOUR
- DRAINAGE LIMIT
- EXISTING SANITARY SEWERS
- EXISTING STORM SEWERS
- DRAINAGE DITCHES

EXISTING SEWERS
VAILSBURG DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010657

EXHIBIT 88

LEGEND
ELEVATION CONTOUR
EXISTING WATER LINES
EXISTING GAS LINES

EXISTING UTILITIES
VAILSBURG DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010658

EXHIBIT 89

LEGEND
ELEVATION CONTOUR
EXISTING ELECTRIC LINES
EXISTING TELEPHONE LINES

EXISTING UTILITIES
VAILSBURG DISTRICT
POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLLC10659

CHAPTER VIII — COMBINED SEWAGE TREATMENT

INTRODUCTION

Since the City has an extensive system of combined sewers with rather large overflow chambers (as described previously), the problem of wet weather discharges must be discussed. Until recently, storm water and combined sewage discharges were considered to be unimportant with regard to pollution potential. However, in recent years a large amount of research has gone into combined discharges with the conclusion that their pollutional potential is substantial. The reasoning behind this conclusion is that even though storm water runoff increases the volume of flow in the sewer and thus improves the dilution factor (concentration), the amount of pollutants discharged on a weight basis is significant. Also the first flush effect (flow in the sewers during the first few minutes of runoff) contains a high concentration of materials that are washed off the topography and other materials that are dislodged from the sewer invert by the increased flow velocity.

As a result, the State and Federal Environmental Protection Agencies (EPA) have been considering the abatement and/or treatment of storm water overflows. Newark, with its large volumes of industrial and domestic wastes overflowing to the Passaic River and Newark Bay during wet conditions, has been required by the Federal EPA to address itself to the overflow problem. Under the National Pollutant Discharge Elimination System (NPDES), as part of the amendments to the Water Pollution Control Act of 1972, permits will be issued regulating overflows in the same manner as waste water treatment plant effluents. That is, volume and load allocations will be instituted with the municipality expected to provide flow abatement and/or treatment.

Therefore, an analysis of the existing overflow problem was considered as part of the City's Pollution Abatement Plan.

Sampling Program

A rather extensive sampling program was undertaken throughout a wide area of the City of Newark to determine the general quality of the effluent in the sewers. Samples were taken solely from the City Sewer System manholes during dry weather periods, but during wet weather, samples were also taken from the ditches. In general, the emphasis was placed on taking wet weather or storm samples. All samples except those collected at the Peddie Chamber were collected by hand. At the Peddie Chamber an automatic water quality sampler was installed and it was set so that samples would be taken on half-hour intervals once the combined sewers started to overflow into the ditches. Table VIII-1 shows the data collected.

Analysis of these samples indicated the feasibility of alternative treatment processes and to what extent industrial waste regulations should be imposed.

Peddie Outflow Sampling Program

The automatic sampler which was installed at the Peddie Diversion Chamber was pre-set so that it would take samples on one half-hour intervals during storm flow periods only. The sampler contained individual bottles for each sample and by analyzing these individual bottles the water quality of the overflow could be determined throughout the entire storm period. Graphs have been plotted for two representative storms, June 16 and 17, 1972 and June 22, 1972. The plots of each of the two storms indicate that the initial concentration of the sewage in this combined sewer is very similar to that which is to be expected in pure sanitary sewage. The Pollutograph of the storm of June 16 and 17 is shown on Exhibit 90. At the beginning of the storm the total solids had a concentration of approximately 500 mg/1, the COD was approximately 550 mg/1, BOD approximately 200 mg/1 and suspended solids approximately 25 mg/1. Only the suspended solids were of the normal range. It would be anticipated that the suspended solids and 5 day BOD for sanitary sewage would be in the order of 250 mg/1.

The graphs show that as rainfall continues the concentration of the sewage becomes much more dilute. This storm is a relatively light storm, with a maximum one-hour intensity of about one-half inch per hour. Even during this intensity, the concentration of the pollutants is reduced by more than a factor of 2. The total solids are reduced to approximately 235 mg/1, the COD is reduced to about 100 mg/1, the BOD is reduced to approximately 35 mg/1, and the suspended solids in this particular case remain at approximately 25 mg/1. The storm was shown to last for approximately 24 hours.

KLLC10660

TABLE VIII-1

STORM WATER QUALITY
PEDDIE STREET DIVERSION CHAMBER

DATE OF STORM: May 31, 1972 BEGINNING: 12:00 END: 3:00 June 1, 1972

Date Of Sample:	5/31/72	5/31/72	5/31/72	5/31/72	5/31/72	5/31/72	5/31/72	5/31/72
Time Of Sample:	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00
Ph	6.9	7.0	7.4	7.1	7.0	7.1	7.0	7.0
COD	--	137	--	133	--	137	--	166
BOD_5	100	85	39	--	--	--	--	--
TOTAL SOLIDS	472	400	400	308	120	284	385	400
VOLATILE SOLIDS	400	375	376	300	110	260	342	380
TOTAL SUSPENDED SOLIDS	176	222	146	122	104	96	80	70
VOLATILE SUSPENDED SOLIDS	150	148	128	110	94	82	70	60

DATE OF STORM: June 16, 1972 BEGINNING: 1:40 END: 7:20 June 17, 1972

Date of Sample:	6/16/72	6/16/72	6/16/72	6/16/72	6/16/72	6/17/72	6/17/72	6/17/72	6/17/72	6/17/72
Time of Sample:	2:10	4:10	7:10	9:10	11:10	1:10	3:10	6:10	8:10	12:10
Ph	6.8	6.5	6.8	7.0	6.9	7.0	6.8	6.9	6.6	7.1
COD	542	54	135	169	81	96	60	113	226	143
BOD_5	195	20	27	75	25	25	13	40	90	63
TOTAL SOLIDS	528	234	244	276	183	185	264	343	459	30
VOLATILE SOLIDS	420	230	235	352	162	170	150	194	225	260
TOTAL SUSPENDED SOLIDS	26	29	18	19	7	7	25	8	15	12
VOLATILE SUSPENDED SOLIDS	29	27	16	18	6	6	23	7	11	6

KLLC10661

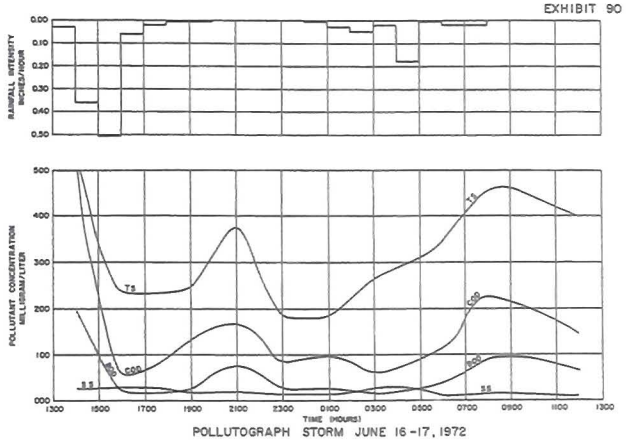
TABLE VIII-1 (Continued)

DATE OF STORM: June 22, 1972 BEGINNING: 3:30 END: 5:40 June 22, 1972

Date of Sample:	6/22/72	6/22/72	6/22/72	6/22/72	6/22/72	6/22/72	6/22/72	6/22/72
Time of Sample.	5:00	6:00	7:00	8:00	9:00	12:00	7:00	11:00
Ph	6.5	6.5	7.0	7.1	7.1	7.0	6.9	7.1
COD	564	100	104	104	108	160	88	96
BOD_5	100	36	35	44	43	100	32	35
TOTAL SOLIDS	712	168	221	157	268	300	300	220
VOLATILE SOLIDS	650	160	200	145	214	229	160	140
TOTAL SUSPENDED SOLIDS	508	30	24	28	50	27	19	15
VOLATILE SUSPENDED SOLIDS	490	27	22	26	38	25	15	13

KLL010662

EXHIBIT 90



POLLUTOGRAPH STORM JUNE 16-17, 1972

In the AM period of 7 to 11 o'clock on the 17th, the concentration of the pollutants was shown to increase again even though there was a slight amount of rainfall during this period. This is probably due to the fact that a maximum discharge of sanitary and industrial waste usually occurs at this time of day.

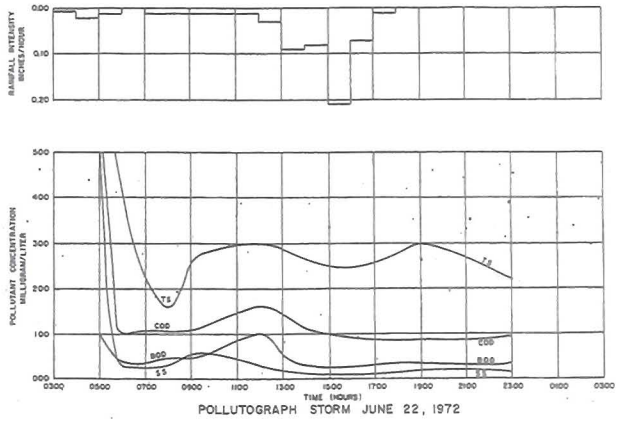
The Pollutograph of the storm of June 22, 1972, as shown on Exhibit 91, indicates a very similar type of condition. At the initiation of rainfall, the total solids were 700 mg/1, the COD was 565 mg/1, the suspended solids approximately 510 mg/1, and the BOD was approximately 100 mg/1. In this case the BOD concentration is substantially below the norm of 250 mg/1. Again, this storm shows that with even a slight amount of rainfall, in this case a maximum intensity of 0.2 inches per hour during the maximum hour, the concentration of pollutants in the combined sewage is greatly reduced. The average for this storm indicates that the total solids were something less than 300 mg/1, the COD was approximately 100 mg/1, the BOD was approximately 40 mg/1 and the suspended solids were in the order of 30 mg/1.

The most important factor demonstrated by these storms is that even with a slight amount of rainfall, the concentration of pollutants is greatly reduced. The initial flow, better known as the "first flush" effect, tends to take out the greatest concentration of pollutants. The proposed treatment process which will be described later in this report has been designed to handle these initial slugs.

The results obtained from the sampling program at the Peddie Chamber are felt to be quite representative of the overall area tributary to Newark Airport, or for that matter, most of the mixed land use basins throughout the City of Newark. Flow in the Peddie Ditch is composed primarily of residential and commercial usage with something less than 10% industrial areas. The dilution of the industrial waste in the Peddie System is so great that it is usually extremely hard to detect. The flow from the industrial areas certainly will have a higher concentration of industrial waste but the total area is much smaller than that of the Peddie District. The industrial waste should be diluted sufficiently by the combined sewage runoff from the Peddie District to eliminate the necessity of its special consideration in the treatment of the combined sewage overflow. Also, as discussed in Chapter IX, most major industrial waste discharge will be subject to pretreatment in the near future.

Exhibit 92 shows the average conditions found to occur during storms in the Peddie District. The Pollutograph basically indicates that total solids have an initial concentration of about 700 mg/1, COD of 550 mg/1, suspended

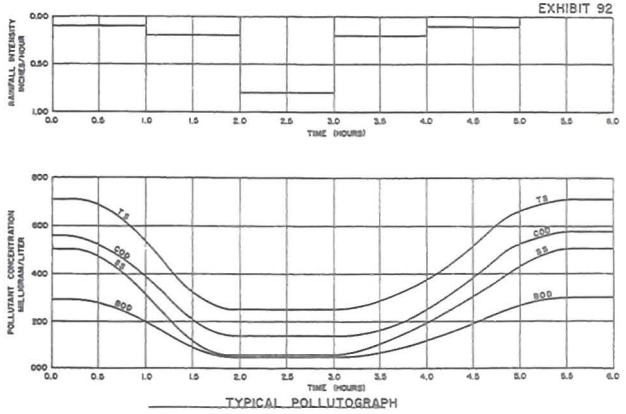
EXHIBIT 91



POLLUTOGRAPH STORM JUNE 22, 1972

KLLC10663

EXHIBIT 92



TYPICAL POLLUTOGRAPH

solids 500 mg/1, and BOD 280 mg/1. These concentrations might normally be anticipated in urban domestic waste. After 1 or 2 hours of light rain these concentrations are reduced nearly 50%. At that time total solids have a concentration of 400 mg/1, COD 290 mg/1, suspended solids 200 mg/1 and BOD 160 mg/1. As is evident from the 2 recorded storms for which Pollutographs have been shown, a low plateau seems to be reached after a certain amount of rainfall. Only a very minor reduction in the concentrations of pollutants occurs even with substantial additional rainfall. At these lower plateaus total solids have a concentration of 250 mg/1, COD 140 mg/1, suspended solids 50 mg/1, and BOD 50 mg/1. This typical Pollutograph was derived on a conservative basis and will be used as the basis of design for the proposed storm water overflow treatment facility. A discussion of the design of the treatment facility will follow later in this Chapter.

Random Sampling

Table VIII-2 shows a rather extensive random sampling program which was conducted on the Newark City Sewer System. The samples taken during wet weather periods give an indication of the concentration of pollutants at areas other than the Peddie Diversion Chamber which might reasonably be anticipated at a combined sewer overflow treatment facility. Some of the areas where the samples have been taken are heavily industrialized and during dry weather periods were found to have extremely high pollutant concentration. However, the wet weather samples indicate that the flow is diluted generally to a concentration which is less than would be anticipated from normal domestic sewage. This random sampling has, therefore, substantiated the typical pollutograph shown as Exhibit 92.

Design Basis

Until recently little work has been done on the design of facilities to reduce the pollutional load of either storm water or the combined sewage which is generated in the urban areas of the United States. Therefore, a firm design basis has not been established for these facilities. The Water Pollution Control Act of 1972 states that this problem must be considered in all future planning in urban areas if they are to be eligible for Federal grants.

In the evaluation of this problem, we have therefore been forced to establish criteria which will meet the intent and possible future regulations of the Water Pollution Control Act of 1972.

To generally establish the magnitude of the problem, an analysis will be prepared which utilizes the Newark Airport drainage basin as a model.

The average daily sewage flow in the South Side Interceptor Sewer is approximately 30 mgd or a total of approximately 11 billion gallons a year. This is the sanitary sewage flow which is generated within the basin. By comparison, the total volume of storm runoff from that same 2500 acre basin is estimated to be approximately 2 billion gallons a year or approximately 17% of the domestic sewage flow which is generated within the basin. Thus, the possible impact of storm water runoff or combined sewage runoff upon the environment if the pollutional load were assumed to be equal would be less than 1/5 of the pollutional load contributed by the average daily sanitary sewage flow. However, it is generally recognized that the concentration of pollutants in storm water is somewhat less than that in domestic sewage. For instance, if the average concentration of pollutants in storm runoff were assumed to be 30% of the pollutional load in the sanitary sewage, the pollution potential of the storm water runoff would be reduced to only 5% of the total yearly pollutional capability of domestic sewage.

The previous description, therefore, illustrates why in the past storm water runoff and combined sewage overflows have not been considered to be a major environmental problem. However, today with the extremely critical

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TABLE VIII-2

RANDOM SAMPLE WATER QUALITY

Location	Date	Time	Weather	Ph	BOD mg/1	COD mg/1	Total Solids mg/1	Total Volatile Solids mg/1	Total Suspended Solids mg/1	Volatile Suspended Solids mg/1
Peddie Street	4/6/72	9:30 AM	Dry	7.9	372	539	480	240	44	6
@ Penn Central	4/6/72	10:30 AM	Dry	8.3	320	575	600	326	78	60
Railroad	4/6/72	11:30 AM	Dry	7.0	330	569	574	316	42	6
	4/6/72	12:30 PM	Dry	8.3	324	547	800	506	121	81
	4/6/72	1:40 PM	Dry	7.1	306	527	531	452	70	50
Frelinghuysen	3/1@2	11:00 AM	Dry	7.4	324	863	1316	1064		
Ave.-South of	3/16/72	12:00 AM	Dry	7.4	380	1091	1320	1122		
Noble Street										
Queen Street	2/17/72	10:00 AM	Dry	2.8	150	901	1500	1002		
@ Jane Parker	3/1/72	11:00 AM	Dry	8.6	324	848	1394	666		
Fence	3/16/72	12:00 PM	Dry	7.0	330	699	856	580		
	4/6/72	9:30 AM	Dry	2.55	264	1315	2237	1294	87	51
	4/6/72	10:30 AM	Dry	10.3	330	2167	5061	3142	750	640
	4/6/72	11:30 AM	Dry	3.4	288	1633	2299	1352	220	76
	4/6/72	12:30 PM	Dry	7.0	340	1230	1220	670	311	95
	4/6/72	1:40 PM	Dry	5.6	500	2409	6252	4597	2100	1650
Extension of	3/1/72	11:00 AM	Dry	7.0	321	359	486	242		
Empire Street	3/16/72	12:00 AM	Dry	7.1	150	334	432	278		
(Jane Parker										
Parking Lot)										
Meeker Street	2/17/72	10:00 AM	Dry	6.9	150	389	546	390		
West of Rt. 22	3/1/72	11:00 AM	Dry	6.5	186	204	660	383		
(48")	3/16/72	12:00 AM	Dry	7.2	200	426	590	348		
Queens Ditch	6/16/72	3:35 PM	Wet	5.6	84	38	1675	542	34	32
	6/19/72	11:10 AM	Wet	5.9	10	45	669	266	11	10
	6/19/72	1:15 PM	Wet	6.2	84	113	573	161	24	22
	6/22/72	11:20 AM	Wet	6.8	81	200	1430	560	37	30
	7/13/72	2:50 PM	Wet	4.3	15	63	420	258	37	33

N- NH_3	N- NO_2	N- NO_3	Ortho Phosphate	META Phosphate
5.35	0.122	2.5	0.12 mg/1	0.07 mg/1

$N[NH_3] = 5.35$ $N[NO] = 0.122$

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TABLE VIII-2 (Continued)

Location	Date	Time	Weather	Ph	BOD mg/1	COD mg/1	Total Solids mg/1	Total Volatile Solids mg/1	Total Suspended Solids mg/1	Volatile Suspended Solids mg/1	IMHOFF CONE mg/1
Vanderpool St.	5/4/74	2:00 PM	Dry	6.9	180	452	368	278	60	55	
@ Frelinghuysen	6/14/72	1:00	Dry	7.1	66	184	341	237	66	60	
Avenue "A" at	5/4/72	2:00 PM	Dry	3.4	72	369	1360	906	21	20	
Emmet St.	6/14/72	12:00 PM	Dry	6.5	114	440	1010	793	364	300	7.5
Avenue "C" bet.	5/4/72	2:00	Dry	3.7	120	775	3396	3344	2190	1680	
Emmet & Astor	6/14/72		Dry	2.5	132	632	1947	866	420	215	5.0
South Street Past	5/4/72	2:00 PM	Dry	5.4	132	780	3180	1040	60	58	
Adam Toward	6/14/72	12:37 PM	Dry	7.5	168	704	2037	700	340	284	4.5
Van Buren											
Wheeler Ditch	6/16/72	3:50 PM	Wet	5.9	120	561	347	340	40	35	
	6/19/72	11:25 AM	Wet	6.8	65	162	392	232	46	40	
	6/19/72	1:30 PM	Wet	6.2	90	196	474	100	170	60	
	6/22/72	11:05 AM	Wet	7.2	195	96	826	540	77	72	
	7/13/72	3:20 PM	Wet	6.4	18	77	288	222	59	46	
				N-NH_3		N-NO_2		N-NO_3	Ortho Phosphate	META Phosphate	
				4.4 mg/1		0.044		1.0	0.62 mg/1	0.92	
Waverly Ditch	6/16/72	3:25 PM	Wet	6.3	1700	4000	4348	3000	2190	1900	
	6/19/72	11:00 AM	Wet	8.9	100	966	821	532	108	100	
	6/22/72	11:30 AM	Wet	5.1	192	88	1120	882	400	375	
	7/13/72	3:10 PM	Wet	7.1	105	174	432	314	186	86	
				N NH_3		N NO_2	N NO_3	Ortho Phosphate	META Phosphate		
				6.05		0.061	1.0	0.98 mg/1	0.25		
Saybrook Place	6/19/72	2:40 PM	Wet	8.2	180	350	760	300	105	65	
	6/22/72	11:50 AM	Wet	10.9	155	192	334	120	66	42	
	7/13/72	2:10 PM	Wet	7.2	110	454	390	237	34	32	

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TABLE VIII-2 (Continued)

Location	Date	Time	Weather	Ph	BOD mg/1	COD mg/1	Total Solids mg/1	Total Volatile Solids mg/1	Total Suspended Solids mg/1	Volatile Suspended Solids mg/1	IMHOFF CONE mg/1
Raymond Plaza	6/19/72	2:35 PM	Wet	7.4	10	15	920	434	28	5	
	6/22/72	11:45 AM	Wet	4.6	66	1192	594	372	84	80	
	7/13/72	2:15 PM	Wet	7.1	27	182	960	380	20	18	
Lake St. @ Second Ave.	6/19/72	2:55 PM	Wet	7.5	156	319	465	300	166	100	
Clay Street	6/19/72	3:15 PM	Wet	7.1	225	425	448	260	170	105	
	6/22/72	12:00 PM	Wet	7.6	130	384	272	145	70	55	
	7/13/72	2:00 PM	Wet	6.8	200	287	652	448	132	96	
Polk Street North of Market	6/19/72	2:10 PM	Wet	6.9	132	323	1609	516	176	70	
	7/13/72	2:30 PM	Wet	7.2	135	70	1060	560	146	140	

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condition of many watersheds and the rapid development in upstream areas, the necessity for reducing the pollutional load of storm water becomes greater.

Storm runoff will have an intensity many times that of the sanitary sewage flow. As an example, the average daily sewage flow in the South Side Interceptor is estimated to be 30 mgd with a dry weather peak flow of approximately 60 mgd. However, the storm runoff from a 2 year frequency storm is estimated to be 1300 mgd. These very high rates of storm runoff occur at very infrequent intervals, and in this area, the majority of the time there is no storm flow. Thus, designing treatment facilities for storm water or combined sewage overflows is much more difficult than designing for sanitary waste. The fluctuations anticipated in a sanitary sewage system seldom exceed a ratio of 4/1, while a storm sewage system will experience flows ranging from no flow on up to several thousand mgd.

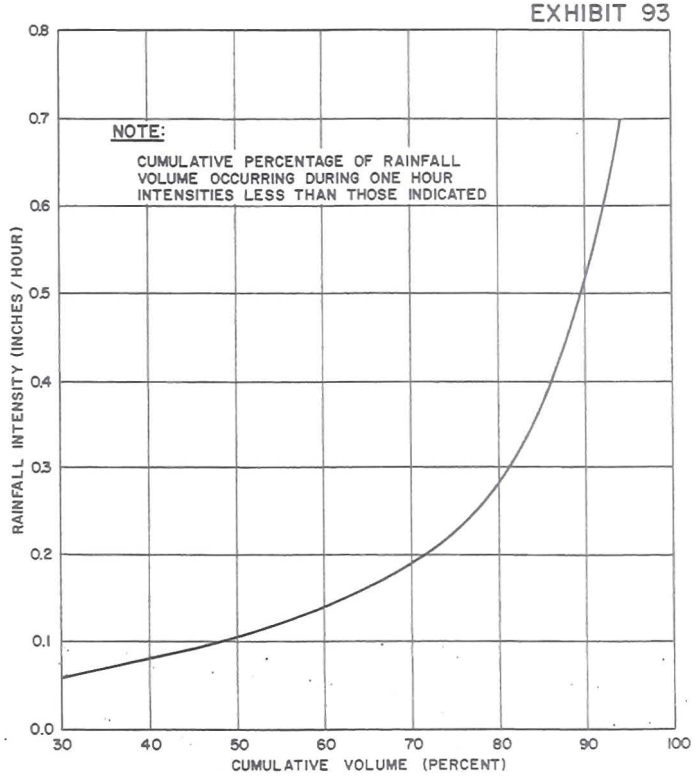
Because of the great fluctuations in the flow in storm sewage systems or combined sewer systems, it would not be practical to design a treatment facility for the maximum flow which could be anticipated. This procedure is also followed in the design of storm drainage facilities since the most extreme storm which could be anticipated would require expenditures of great sums of money which could not be justified.

In an attempt to select a design point for a design storm frequency a detailed analysis was made on the distribution of rainfall within the Newark, New Jersey area. The basis of that analysis was the rainfall records which have been recorded at Newark Airport.

Exhibit 93 presents the results of that analysis in graphical form. The objective of the analysis was to determine the percentage of rainfall which occurred during storms of varying intensity. The intensity of rainfall is one of the prime factors controlling the quantity of storm runoff, and within a specific watershed at a specific time of development, is the controlling factor of the rate of storm runoff. Thus, if a rainfall intensity of 0.1 inches per hour was to occur, the storm runoff would be approximately one-half of the rate of storm runoff which would occur from 0.2 inches per hour.

The purpose of the analysis was to determine that percentage of the total rainfall volume that could be passed through a treatment facility at a given design point. For example, if a treatment facility were designed to accommodate a flow rate equivalent to a rainfall intensity of 0.1 inches per hour,

EXHIBIT 93



RAINFALL INTENSITY DISTRIBUTION

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what percentage of the total yearly rainfall would pass through the treatment plant and what percentage would have to be bypassed because it exceeded the treatment plant capacity. Exhibit 93 demonstrates that at a design flow equivalent to 0.1 inches of rainfall per hour, approximately 50% of the total yearly rainfall could be passed through the treatment plant. This indicates that a very large amount of our annual precipitation occurs during storms with a very low rainfall intensity. In like manner, Exhibit 93 indicates that slightly over 70% of the total annual precipitation occurs during rainfall with an intensity of less than 0.2 inches per hour. It is interesting to note that the graph rises sharply as the cumulative volume approaches 100%. Thus, during high intensity storms, the percentage of rainfall which does occur represents a rather small percentage of the overall volume of rainfall occurring during a given year.

Exhibit 93 has thus given us the relationship between a certain design storm for a treatment facility and the corresponding percentage of the total rainfall which would be accommodated through the treatment plant. In addition to that criteria, the pollutional load during rainfalls of varying intensity has been considered. In the analysis of the combined sewage overflow treatment facility, it has been assumed that the initial concentration of pollutants in the storm water at any rainfall intensity of less than 0.1 inches per hour would be the following:

Total Solids	400 milligrams per liter
BOD	140 milligrams per liter
COD	300 milligrams per liter
Suspended Solids	200 milligrams per liter

During the remainder of a storm or at any time when a storm flow exceeds an equivalent rate of 0.1 inches per hour, the following concentrations have been assumed to exist in the wastewater:

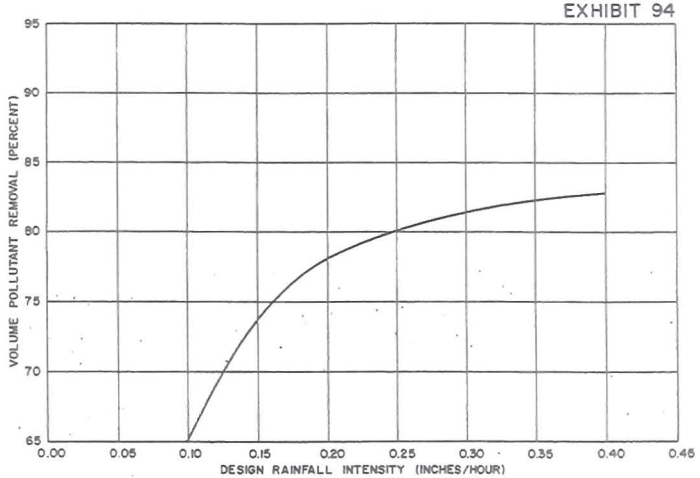
Total Solids	50 milligrams per liter
BOD	50 milligrams per liter
COD	125 milligrams per liter
Suspended Solids	50 milligrams per liter

These certainly are assumed criteria and the actual concentration of pollutants in the storm water would depend upon antecedant rainfall, the time of day and several other factors. However, from the substantial amount of sampling which was done in Newark, these figures are considered to be generally representative.

These concentrations were then combined with the rainfall intensity distribution to obtain a general pollutant distribution. Treatment efficiencies for a combined sewage overflow treatment facility were then assumed.

The efficiency of the plant was assumed to be 90% at one-half design flow and 75% at design flow. Thus, if a treatment facility were designed for 550 c.f.s., 75% of the pollutants were assumed to be removed. But at half flow or 275 c.f.s., the efficiency was assumed to be 90%. The analysis of available data on the efficiency of storm water treatment facilities indicate that these efficiencies can be obtained. Several different design flows for a treatment facility were then assumed. When these removal efficiencies were applied to the pollutant distribution which was generated from the rainfall intensity distribution, a pollutant removal efficiency graph was obtained as presented on Exhibit 94. This graph illustrates that a treatment facility designed for a runoff intensity equivalent to a design rainfall of 0.25 inches per hour could remove 80% of the total volume of pollutants carried

EXHIBIT 94



POLLUTANT REMOVAL EFFICIENCY

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by the storm water runoff. This removal would be on an average yearly basis and during extreme storms when extremely high volumes of water pass through the system the removal efficiencies would be greatly reduced.

It is our opinion that this analysis has been prepared on a very conservative basis. During a light rain lasting for a period of a day, the pollutant concentration during less intense periods (less than 0.1 inches per hour) would drop well below the concentration normally found in raw domestic sewage. In addition, in the case of the Newark Airport Drainage Basin, a substantial amount of flow during these light intensity rainfalls is also discharged to the South Side Interceptor Sewer. Section 2 of this chapter presents a description of the historic frequency of the overflow regulating chambers on the South Side Interceptor Sewer.

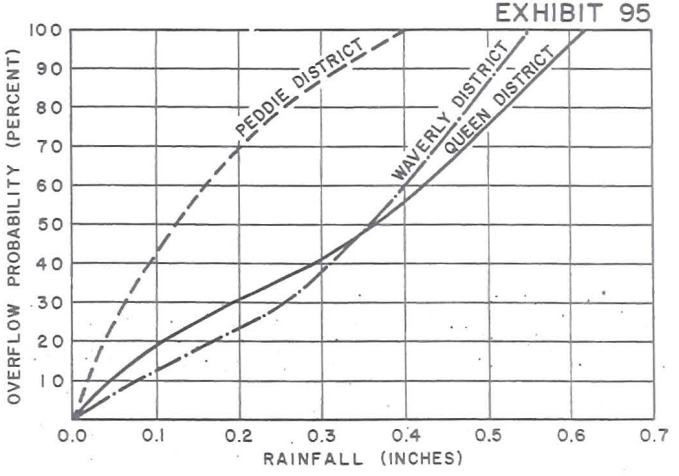
FREQUENCY OF OVERFLOWS

The South Side Interceptor Sewer was constructed in 1965 to collect the dry weather sanitary flow that had previously discharged into the Newark Meadows drainage ditches. The three major combined sewer districts bordering the Meadows were connected to the South Side Interceptor by regulating diversion chambers. During wet weather, the storm flow exceeds the capacity of the South Side interceptor sewer and the excess flow is diverted into drainage ditches. Each of these chambers is equipped with a dry weather flow circular chart recorder. The chambers are constructed such that only the flow going into the interceptor is recorded. Until the past decade the overflow of combined waste during storm flow conditions was not considered to be a major threat to the environment. The tremedous volumes of rainfall runoff were felt to dilute the sewage to such an extent that the assimilative capacity of the receiving waters was sufficient to handle the waste load. This may well have been the case when major portions of the watersheds were still undeveloped and contributed primarily pure water to the storm flow. Today, however, in many locations the entire watershed is developed and the assimilative capacity of the receiving waters has been exceeded. The pollutional load caused by these wet weather discharges is now considered to be a prime cause of pollution.

To estimate the frequency and magnitude of the overflows an analysis was made of the three diversion chambers on the South Side Interceptor Sewer. The flow records at each of the diversion chambers were compared to the daily rainfall records recorded at Newark Airport for the year 1967 and 1970. The rainfall intensity causing either an overflow or abnormally high peak flow was tabulated for each of the three chambers and then the overflow probability calculated. Exhibit 95, presents the results of this analysis. The Peddie diversion chamber is most sensitive as a rainfall of 0.1 inch will cause an overflow 40% of the time and 0.2 inch intensity will cause overflow 70% of the time. During the two years which were analyzed the Peddie diversion chamber overflowed an average of 72 times per year while the Queen and Waverly chambers overflowed 33 and 31 times per year respectively.

The total volume of storm water overflow from these three basins has been estimated to be 1.5 billion gallons per year, an average of 4 million gallons a day (MGD). The Wheeler and Adams Districts have been estimated to discharge an average of 2 MGD of wet weather flow bringing the total to an average 6 MGD. The pollutional load of this large volume of combined sewage is extremely great and it is the objective of this section to determine the most feasible means of eliminating it.

EXHIBIT 95



DIVERSION CHAMBER OVERFLOW PROBABILITY

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TREATMENT METHODS

Most methods for treating combined sewage have been developed within the last ten years. As such, there have been a limited number of full scale plants constructed and thoroughly analyzed. Due to the variability of the quality aspects of combined sewage from area to area and the lack of proven design data for treatment plants, a pilot plant study for a particular treatment method is the only practical way of determining whether or not a prototype plant will physically and economically work. Since the Federal EPA has an active research and development program in this field, applications were filed with them on behalf of the City of Newark to obtain Federal funding for a demonstration grant for the above mentioned pilot plant. Unfortunately, the grant application was not initially successful. However, it is felt that this application should be refiled by the City with the hope of obtaining approval by the Federal EPA. It must be understood that a treatment system such as the one proposed below has to be studied on a pilot plant basis.

In order to arrive at a particular treatment process to be studied and later used, a number of physical and technical factors must be considered. The first factor is the limited amount of land available within the City limits. The only undeveloped land of any size is located near the Airport area. This general location has an added advantage of having one third of the City's present combined sewage overflows directed to it via the Peripheral Ditch encircling the Airport.

The next factor to consider is the type of treatment method to be used. As stated before, various methods are being developed to treat combined sewage. Most of these methods are centered around physical and chemical means of removing pollutants. The information available from Federal EPA and proprietory publications indicates a wide variability of the quality content of combined sewage. As such, the pilot plants studied and the few prototype plants constructed have been developed for specific areas having unique pollutional parameters. Another problem that makes selection of a treatment scheme more difficult is the lack of State or Federal regulations concerning the required removals of combined sewage contaminants. The receiving water concerned in this report, Newark Bay, is presently classified as TW-3 by the New Jersey Department of Environmental Protection. This classification requires that: "domestic wastes, separately or in combination with industrial wastes, prior to discharge into waters of the Passaic River Basin classified as TW-2 or TW-3 shall be treated to a degree providing, as a minimum eighty percent (80%) reduction of biochemical oxygen demand at all times, including any four-hour period of a day when the strength of the wastes to be treated might be expected to exceed average conditions; it is the objective of this regulation that the biochemical oxygen demand of effluents discharged shall not exceed 50 parts per million." Also to be noted in the usual state regulation is the assumption that 80% removal of BOD will simultaneously cause a similar removal of suspended solids.

For domestic sewage, BOD and suspended solids removals are generally accepted parameters that are used to design a typical domestic sewage treatment plant. Recently, however, other quality parameters such as chemical oxygen demand (COD), total organic carbon (TOC), phosphorous and nitrogen removals, are being considered when any type of treatment plant is designed. In particular, when industrial wastes contribute to a sewer system, as in Newark, these additional parameters must be recognized. Therefore, the proposed treatment will be designed with all important quality parameters considered.

The combined sewage treatment methods that have been studied and proven to work to various degrees of effectiveness are:

1. Storage with delayed treatment at an expanded, existing sewage treatment plant.
2. Chemical treatment
3. Microscreening
4. Air flotation
5. Activated Carbon

All of these methods have been tested on a pilot plant and/or treatment plant basis for the treatment of domestic sewage. Recently they have been tested on a pilot plant basis for the treatment of combined sewage. Test results indicate that except for the relatively expensive (in terms of operationg costs) chemical treatment method, none of these methods by themselves can obtain appreciable removals of all pollutional parameters. Method one suffers from the requirement of large storage areas that will later, under a reduced dry weather flow, be fed back into a biological system. Chemical treatment as stated before is too costly with the added disadvantages of requiring constantly changing chemical additions for an intermittent and varying flow condition along with a serious problem of the

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disposal of accumulated chemical sludge. Microscreening does a very efficient job of removing suspended solids (90 to 95% removal) but will not remove any of the dissolved pollutants as reflected in BOD, COD, etc., parameters. Also, due to the small openings of the screens any appreciable oil and grease content in the storm flow could quickly clog the mechanism. Air flotation, while averaging 50% suspended solids removal and accomplishing a certain amount of beneficial aeration and phosphate removal, cannot remove sufficient quantitites of the previously mentioned contaminants. Activated carbon while able to remove most dissolved substances, including heavy metals, efficiently has not been tested under combined sewage flows. Also, the influent to the carbon beds cannot contain more than 50 mg/l of suspended solids. It must be noted at this point that biological systems will not be considered due to the difficulty in maintaining a bacterial population that is easily susceptible to the damages caused by unusual chemicals while operating the plant intermittently. Therefore, in order to obtain a decent removal of all contaminants it is felt that activated carbon beds should be used preceded by a solids separation unit. Microscreening and dissolved air flotation have been tested previously under similar conditions with effective removals obtained. However, in addition to these two methods an undeveloped method involving the principal of vortex separation will be included in any pilot plant study. It is felt that the pilot plant analysis will enable us to analyze what solids separation units and design parameters will yield an optimum prototype design.

The plant study will investigate the disposal of accumulated sludge, one of the most costly items in any treatment plant. As a first step, the dewatering of the sludge must be considered in order to significantly reduce the sludge volume to be handled. Dewatering techniques using sludge thickening tanks and vacuum filters will be studied. The remaining dry sludge can be used as a supplementary fuel for the regeneration of the activated carbon or for plant heating. Appropriate air pollution control devices will be provided under prototype conditions. However, all of the sludge handling and disposal may be avoided if it is determined that the accumulated sludge can be pumped to an existing sanitary sewer line or removed by a separate arrangement with a sludge disposal contractor.

Chlorination of such a large flow presents a problem in that the usual required average contact time of thirty minutes would require a large chamber that would add a great deal to the capital cost of the plant. Also, due to the large amount of chlorine that is needed, a railroad siding for the delivery of chlorine tank cars would be needed. Both of these problems can be solved by locating the chlorination equipment adjacent to the plant. This location would solve the contact time problem by the use of the Peripheral Ditch as a natural detention channel. The delivery of the liquid chlorine would also be solved by the existing Penn Central Railroad of New Jersey tracks that pass near the site of the plant. A schematic of the proposed pilot plant is shown on Exhibit 83.

COST ANALYSIS

Tables VIII-3 and VIII-4 show the preliminary cost estimate for sewer separation and combined sewage treatment.

The cost of pipe separation of the combined sewer has been estimated to be $27,000 per acre. The construction costs do not reflect the tremendous inconveniences and hazards created by the excavation for and installation of sewers on nearly every street in the drainage basin. The loss of business and loss of time due to street closings would surely cause a large economic loss

TABLE VIII-3

COST ESTIMATE FOR
COMPLETE SEWER SEPARATION CONTRIBUTING
TO TREATMENT PLANT

Interceptor and Lateral Sewers	
Peddie	$ 25,647,000
Queens	1,225,000
Waverly	1,508,000
Adams and Wheeler	8,928,000
Subtotal	$ 37,308,000
Total Area of Separation - 2,630 Acres	
Utility Relocations $4,000/acre	10,520,000
Building, plumbing charges $4,000/acre	10,520,000
Total	$ 58,348,000
20% contingencies, engineering and legal	11,670,000
TOTAL	$ 70,018,000

KLLC10672

to the City. The construction of a sanitary sewer system in the City streets will also require a great deal of excavation adjacent to the existing brick sewers. As previously discussed this could cause extensive damage to them requiring their replacement at a tremendous cost. Such a condition is extremely difficult to evaluate.

It would be anticipated that a reduction of the unit size and cost would result from the determination of maximum loading rates in the pilot study.

Treatment of the combined sewage overflow has been estimated to cost $42 million less than pipe separation. In previous studies in other areas of the country treatment of combined overflows has been estimated to cost from one-half to one-third the amount of pipe separation. The reason for the significant difference in this location is the extensive area within the drainage basin which has not been included in the area being separated. Of the 7,415 acres contributing storm flow to the pump station and the treatment plant, 2,630 acres have been included in the area to be separated. The remaining land is primarily the Newark Airport and areas of Elizabeth which drain to the peripheral ditch. In a drainage basin consisting entirely of residential, commercial and industrial development, the cost advantage for treatment would be substantially higher.

In addition to the cost advantage of a combined treatment facility, there is one other major factor in its favor. Storm runoff in urban areas even when drained in separate sewer systems has been found to have an extremely heavy pollutional load. The Federal and State Governments have been investigating the effects of this on the environment. It is possible that in the not too distant future water quality standards will be established for the discharge of storm water from urban areas. This could require the construction of treatment facilities to control the quality of storm water runoff. Even if the City of Newark proceeds with the separation of the combined sewers, it could be faced with the construction of a storm water treatment facility to conform to possible Federal or State regulations. Our presently proposed combined sewer overflow treatment plant will meet the probable storm water standards and eliminate the double expenditure.

On the basis of construction cost, minimum disruption of the City during construction, removal of pollutants from storm runoff and probable future storm water standards, we recommend the construction of the wet weather combined sewer overflow treatment facility.

TABLE VIII-4

PRELIMINARY COST ESTIMATE FOR TREATMENT FOR COMBINED SEWAGE

Cost Estimate will be based upon projects that are described in various company and private publications.

Peak Flow = 550 cfs or 360 mgd

Capital Costs		
Microstrainers	$12,000/mgd x 360	$ 4,320,000
Air flotation units	$30,000/mgd x 360	
Beds and supporting units - $18,000/mgd		6,480,000
Carbon - 28,000,000 lbs. x 0.30 $/lb.		18,400,000
Sludge removal storage and pumping		240,000
Sludge removal dewatering		
Chlorination		1,200,000
Controls		1,200,000
Land		360,000
Pump facilities		1,000,000
Subtotal		$23,200,000
20% contingencies, engineering & legal		4,640,000
Total		$27,840,000

Location of Combined Sewage Treatment Plants

Two areas of the City were selected as locations for treatment facilities. The first plant would be in the vicinity of Newark Airport as shown on Exhibit 96, and would treat the combined sewage from the Peddie, Wheeler and Adams Districts (approximately one-third of the City). This plant would be designed to treat an average flow of 550 c.f.s. with removal of approximately 75% of all pollutants.

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The second plant would be located in the vicinity of the Colonnade Apartments as shown on Exhibit 96. This plant would serve the Millbrook District and would probably be similar in treatment methods to that of the first plant.

The rest of the City contains areas that have some separation of sewers already. These areas discharge at various points into the Passaic River and would probably require some on-site treatment of storm water or combined sewage overflows prior to their discharge. More than likely only some sort of solids separation unit would be needed to reduce the pollutional load of a waste that would contain mostly suspended organic matter from domestic sewage and topographical runoff since only a small amount of industrial wastes would be contained in the overflow.

Recommendations

The following recommendations are made with regard to the problem of combined sewage overflows in the City:

1. The idea of two combined sewage treatment plants should be pursued in the following manner:

   a. Discussions with Federal EPA officials should be initiated concerning financial support for the construction of the two combined sewage treatment plants. Under the NPDES regulation published in the Federal Register, it appears that the City would not be forced to provide this treatment of overflows without Federal aid.

   b. The application for Federal EPA research and development funds for the construction of the previously mentioned pilot plant near Newark Airport must be pursued by the City. It seems entirely reasonable for the City to combine forces with the Passaic Valley Sewage Commissioners to pursue the pilot plant program with the Federal EPA.

2. The areas not affected by the two plants, should be studied further with regard to the feasibility of on-site treatment or separation of their sewer systems if required by the NPDES program. This particular recommendation avoids the use of more combined sewage treatment facilities because of a lack of suitable sites for treatment plants in these areas.

EXHIBIT 96

LOCATION OF SEWAGE TREATMENT PLANTS

POLLUTION ABATEMENT PLAN
CITY OF NEWARK, NEW JERSEY

KLL010674

CHAPTER IX — INDUSTRIAL WASTE

INTRODUCTION

Ideally situated geographically, Newark contains a wide variety of industries that support the economy of not only the City but that of the entire New York Metropolitan area. As a result of these diverse industries, the industrial waste generated in the City contains almost all known physical, chemical and biological pollutants. The impact of these pollutants upon the sewer system, the Passaic Valley Sewage Treatment Plant (PVSTP) and the final receiving waters can be severe. It is the intention of this section of the report to offer an insight into the problem of industrial waste and to offer recommendations for the improvement of the current disposal situation.

Present System of Industrial Waste Control

The City presently controls the discharge of industrial waste into its sewer system by means of a revised ordinance written in 1951. This ordinance does contain most of the technical language necessary to control industrial discharges. Its major fallacy lies in the fact that there are no specific limitations of modern day water quality parameters such as COD, heavy metals, cyanide, etc. This fallacy coupled with a general lack of enforcement has allowed and continues to allow a large amount of untreated waste to pass into the sewer system. A result of this lack of enforcement is the continued deterioration of the City's sewer system.

The Passaic Valley Sewage Commissioners (PVSC) is responsible for any wastes that reach the Passaic River and does attempt to monitor wastes that enter into the sewer system and eventually find their way into their primary treatment plant. The PVSC has realized the fact that this influx of gross pollutants into the sewer system has to stop not only for obvious contamination to the receiving water but to prevent future damage to their biological (secondary) treatment units. These biological treatment units use the activated sludge process. Although able to withstand minor upsets from small amounts of industrial waste, the activated sludge process will not be able to operate near its design efficiency if the present large amounts of industrial wastes are allowed to enter the plant. With this thought in mind, the PVSC conducted an Industrial Waste Survey (IWS) in the form of a questionnaire coupled with random sampling at key industries in the City.

It is obvious that the City must cooperate with the PVSC in a concerted effort to enforce present and future industrial waste regulations. Lack of enforcement can only result in further deterioration of an old sewer system along with a continued decline in area wide water quality.

Industrial Waste Survey

In order to gain a limited physical and chemical viewpoint of the quality of industrial waste in the City, a sampling program was undertaken. The intent of this program was to determine the general characteristics of the sewage prior to any treatment. All samples were taken from manholes and were not taken for particular industries and, therefore, these samples represent a mixture of all industrial and domestic waste at each of the locations. The analysis of these samples has yielded a good indication of the relative strength of the sewage once it becomes thoroughly mixed throughout the system.

Seventeen locations in addition to the Peddie Diversion Chamber were sampled on one or more occasions. The results of the sampling program yielded some astonishing results. Even in combination with relatively mild wastes from domestic sources, industrial waste in some areas was found to be so strong that it greatly affected the character of the sewage. To demonstrate this, the following list presents the maximum concentrations found in our sampling programs:

Minimum pH	2.5
Maximum pH	10.3
Maximum COD	4,000
Maximum Suspended Solids	2,190
Maximum Volatile Suspended Solids	1,900
Maximum Total Solids	6,252
Maximum Volatile Solids	4,592
Maximum BOD	2,700

To yield such high concentrations in a sewer system containing the effluent from many sources, there must be some industries discharging wastes with extremely high concentrations of pollutants. Locating the exact source of

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each of these pollutants is a very time consuming process. The City of Newark Bureau of Sewers in recent years has found some industries which are violating the present City Ordinances controlling the discharge of industrial waste into City sewers, but the process has been extremely slow primarily because of the lack of sufficient manpower and funds.

Five of the random sampling locations were located in the Queen District. Tabulations representing the results of the sampling program at these locations are included in the appendix of this report. The Queen District is relatively representative of the smaller industrial areas. There are no major water users among the industries in this area, but even so, the waste in the Queen District sewers is extremely strong at relatively frequent periods.

Samples were taken on Meeker Street where it passes under Route 22. The quality of the samples was found generally to be that of domestic sewage, which would be anticipated because there are few industries upstream of this location. However, on several occasions a gasoline odor was noted in the sewage. This could be due to a leak or dumping from a gas station in this area.

However, the further downstream in the system that samples were taken, the more extreme the concentration of pollutants. Samples taken in Queen Street or the Queen Diversion Chamber during dry flow periods indicate extremely high concentrations of pollutants. The sewers in the Queen District are in a deteriorated condition and generally have inadequate slopes to generate sufficient velocities to carry all suspended matter into the South Side Interceptor Sewer. During dry weather flow periods it is believed that a substantial amount of suspended material settles to the bottom of these sewers. Then, during the storm flow periods, the settled material is picked back up in suspension and is carried out into the Queen Ditch area. In addition to the determinations made and indicated in the tabulation in the appendix, several other observations of gross pollutants have been made in this district. The 4' high by 6' wide box culvert in Empire Street frequently carries an extremely heavy concentration of oil. This oil is probably originating from either an oil processer or transporter, a major machine company or a large garage. Sewers in Frelinghuysen Avenue originating in the area of the intersection of Frelinghuysen Avenue and Dayton Street often carry high concentrations of material that appears to be graphite. Attempts should be made to end this gross pollution at the earliest possible date.

Four locations in the Adams District were also sampled. In this heavily industrialized area the water quality was poor as should be expected. The pH of many samples was quite acidic with the lowest pH reported as 2.5. The South Street Interceptor Sewer was also found to contain very high concentrations of total solids.

Random samples were also taken from many of the remaining residential districts of the City. The Main Interceptor of the Saybrook District was sampled at Saybrook Place, the Raymond District Interceptor was sampled at Raymond Plaza, Millbrook District was sampled at Lake Street and Clay Street, and the Ferry District was sampled at Polk Street. The tabulations of the results of these samples are presented in the appendix of the report. These samples were found to conform very closely with the samples taken from the Peddie District.

In summary, the sampling program has shown that the combined sewers draining the residential areas of the City of Newark have pollutant concentrations during dry weather periods very similar to that which would be predicted by most textbooks. During wet weather periods the concentration of pollutants in the combined sewers can and has been substantially reduced and in some cases the dilution was to such an extent that the effluent would have met the majority of the criteria which has been established by the State of New Jersey for the discharge of sewage treatment plant effluent into tidal waters.

These concentrations (residential area) however, are not as low during these wet weather periods as commonly believed in the past. In the industrial areas the strength of the waste during dry weather flow periods is so extreme in many locations that it makes biological treatment of this waste impossible and in addition, also jeopardizes the structural and hydraulic integrity of the sewers. The extremely acidic condition which is found in many locations has certainly damaged a great deal of the concrete pipe which exists in the system. The ability of the old brick and tile sewers to resist this is greater, but certainly the mortar which holds the bricks together has been attacked. In addition, high concentrations of settled solids have been deposited in many sewers and during storm periods, this highly polluted material is resuspended and carried into the ditches around Newark Airport and into Newark Bay.

The above information coupled with data available from the Industrial Waste Survey conducted by the PVSC provides a good generalized picture of the industrial waste situation in the City.

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National Pollutant Discharge Elimination System (NPDES)

The NPDES created as part of the Federal Water Pollution Control Act Amendments of 1972 will have a direct bearing on industrial waste discharges in the City. This public law prohibits any person from discharging pollutants into a waterway from a point source unless his discharge is authorized by the U.S. Environmental Protection Agency (EPA) or by an approved State agency. A direct result of this law as described in regulations published in the Federal Register will be that a facility like the PVSC sewage treatment plant as well as all upstream industries must have a permit to discharge its effluent. When a permit is written only a certain, reduced amount of untreated industrial waste will be allowed into the treatment plant. A result of this condition will be that major industrial waste dischargers* will only be allocated a certain waste load to discharge into the sewer system. Effluents from an industry will be judged on a weight basis (pounds per day) not on concentrations (mg/1). This condition of the PVSC permit, when issued, will force many industries to pre-treat their wastes before discharging into the sewer system. In addition, prior to the computation of industrial waste load allocation by the EPA, extensive sampling of industrial waste discharges similar to the current PVSC Industrial Waste Survey will be required.

*A major contributing industry is one that (1) has a flow of 50,000 gallons or more per average work day; (2) has a flow greater than 5 percent of the total flow carried by the municipal system receiving the waste, or (3) has a toxic material in its discharge.

RECOMMENDATIONS

Based on the previous discussion concerning industrial waste in the City, the following recommendations are offered:

1. In order to prevent immediate, further deterioration of the City's sewer system, a complete cooperative effort must be undertaken with the PVSC to stop all gross industrial pollution. This recommendation has been made easier due to the present availability of the results of the PVSC Industrial Waste Survey which has pinpointed industries that are discharging dangerous pollutants. Also some additional grab sampling and analysis should be undertaken.

2. The City should cooperate with the Federal EPA in supporting the NPDES. The NPDES will eventually solve most of the City's water quality problems, but until the time when the NPDES takes full effect, the City must not be lax in enforcing their current industrial waste discharge ordinance. Although the ordinance could use some revision as discussed earlier, it was written broadly enough that water quality parameters that were not specifically cited could be included by use of Section 27.19 of the ordinance.

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12. "Report Upon Newark Meadows Flood Control Pumping Station", prepared by Elson T. Killam Associates, Inc. Newwark, New Jersey, January, 1961.

13. "Study on Newark Meadows Pumping Station", prepared by James P. Purcell Associates, Newark, New Jersey, 1970.

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Passaic Valley
Sewerage Commissioners

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(201) 344-1800

CARMINE T. PERRAPATO
EXECUTIVE DIRECTOR

JAMES M. PIRO
CHIEF COUNSEL

NORMAN E. DARMSTATTER
CLERK

September 27, 1984

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Kenneth Goldstein, Section Chief
Industrial Pretreatment Program
Water Quality Management
Department of Environmental Protection
P.O. Box CN-029
Trenton, NJ 08625

RE: PRETREATMENT PROGRAM ANNUAL REPORT NO. I

Dear Mr. Goldstein:

Enclosed is the first annual report submitted by Passaic Valley Sewerage Commissioners (PVSC) to the NJDEP. This report covers the one year period from August 1, 1983 through July 31, 1984. Based on recent discussions with NJDEP we anticipate that format and content changes will be made to enhance the report's usefulness. One format change is being made in this report with the concurrence of NJDEP. The descriptive and narrative portion of the report will be combined as the first part. The various industrial inventory, categorical, monitoring and other forms will be placed at the end of the report. This should facilitate review. We would be happy to meet with your staff to answer any questions or discuss efforts to further improve this important document. If you have any questions please contact Frank D'Ascensio.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Carmine T. Perrapato,
Executive Director

CTP/nk

Enclosures

cc: Frank D'Ascensio

RECEIVED
SEP 28 1984
DEPT. ENVIRONMENTAL PROTECTION
BUR. OF IND. WASTE MGMT.

KLL025765

AR-1

INDUSTRIAL PRETREATMENT PROGRAM ANNUAL REPORT

NJPDES Permit Holder or Sewer Authority Name: Passaic Valley Sewerage Commissioners

Report Date: September 27, 1984

Period Covered by This Report: from 8/1/83 to 7/31/84

Period Covered by Previous Report: from N/A to

Name of Wastewater Treatment Plant(s)	NJPDES Permit Number
Passaic Valley Sewerage Commissioners	0021016

Person to contact concerning information contained in this report:

Name: Frank P. D'Ascensio,

Title: Superintendent Industrial Waste Control

Mailing Address: 600 Wilson Avenue

Newark, New Jersey 07105

Telephone No.: (201) 344-1800

I have personally examined and am familiar with the information submitted in this document and attachments. Based upon my inquiry of those individuals immediately responsible for obtaining the information reported herein, I believe that the submitted information is true, accurate and complete.

September 27, 1984
Date

Signature of Official

Executive Director
Title

PRETREATMENT PROGRAM ANNUAL REPORT NO. 1

AUGUST 1, 1983 THROUGH JULY 31, 1984

II. Table of Contents Not used.

III. Report Summary

Although many industrial users have been placed in one of the industrial categories, there are other users that will not be categorical industries. This should be evident when the report is reviewed.

On June 6, 1984, three New Jersey Galvanizing officials were indicted for illegally dumping hazardous waste into the PVSC sewer system. This case resulted from close cooperation between City of Newark officials, PVSC Industrial Waste Control Department personnel and Essex County law enforcement officials. Although these organizations have cooperated in the past, this is the first instance where a criminal indictement resulted from information gathered initially by City of Newark and PVSC personnel.

On June 19, 1984, PVSC conducted a Public Hearing concerning the LEL Regulation. This regulation will establish numeric limitations for discharges of flammable or explosive materials to the sanitary sewer. The transcript and other records are under final review by Counsel and we anticipate that the Regulation will be submitted to the Commissioners for their review at the October meeting. USEPA and NJDEP have expressed interest both in the regulation, to use it as a model, as well as the design of the instrument which was developed for field use.

NJDEP promulgated Oil and Grease Regulations which became effective on July 2, 1984. They contain pretreatment limitations on petroleum oil of 100 mg/l (monthly average) or 150 mg/l (maximum single sample) for indirect dischargers. These Regulations also allow the treatment plant to request an exemption from this limitation if three conditions are met. They are as briefly stated: that the effluent from the treatment plant is less than 10 mg/l (average) and 15 mg/l (maximum) for oil and grease; that the sludge disposal option considers the hydrocarbons beneficial; and that the costs for the removal of the oil and grease are proportional to the other operation and maintenance costs. Garden State Paper has requested an exemption in accordance with this provision and it is under review.

When EPA promulgated the pretreatment limitations for the Leather Tanning Category, a provision was included in these regulations which allowed the treatment plant to request a modification to the limitation for Hydrogen Sulfide. The three largest leather tanners requested that PVSC modify the limitation on Sulfide. A consultant was selected by PVSC and conducted a study to determine whether the modification was reasonable, and if so what the revised limitations should be. The three tanners who requested the modification paid the cost of the study. Based on the recommendations contained in the report (changed somewhat by PVSC to make the limitations more strict), a request was submitted to EPA on February 17, 1984 to modify the limitation for sulfide. A reply has not yet been received despite frequent follow-up contacts.

We are awaiting approval of the priority list from EPA so that grant funds could be made available for the Priority Pollutant Scan of the PVSC influent. This would be the first step in our program for control and determination of treatability for the organic priority pollutants.

The Central Metal Recovery Facility (CMRF) which is designed to recover plating and metal finishing metallic ions for reuse has hit a snag over the NJDEP verbal decision to designate the metal-resin material as waste. This would bring the hazardous waste regulations into play and cause the Port Authority of NY/NJ to back-out of the project. Since the Port Authority plans to at least provide financial assistance, the project would be in serious trouble if this were to happen. The DEP is willing to revise the designation if USEPA grants a waiver. The first step was for the Platers Association to write to Dr. Marwan Sadat of DEP and request an official determination of the metal-resin material. Once the DEP determination is official, then an appeal could be made to EPA for the granting of a waiver.

IV. Industrial Inventory - See Form AR-2

V. Complaince with Categorical Standards by Industrial Users - See forms AR-3a, AR-3b, and AR-4

VI. Monitoring Programs - See Forms AR-5a, AR-5b, AR-5c and AR-6

Because we have integrated monitoring for User Charge with monitoring for Pretreatment it is difficult to separate the two. We are working on ways to modify the system so that we can separate them. This should be complete by the next annual report. In the interim, the data reported includes both user charge and pretreatment.

During the year, 4,132 samples were picked up and 10,172 analytical tests were performed on these samples. In addition, over 900 inspections were made in connection with User Charge and Pretreatment. The bulk of the sampling and inspection work was due to User Charge. However, as more Categorical Standards are promulgated and as more industrial users come into compliance, more sampling and inspections for pretreatment will be necessary. It is expected that when the PVSC Pretreatment Program has been fully implemented, the work required for User Charge and Pretreatment will be almost equally divided.

Sixty companies have installed pH recorders and/or pH control systems due to problems with pH control. Of this number, only six companies were formally notified to make these installations. The remaining fifty-four companies willingly cooperated with informal PVSC notification to correct the existing problem. At present, several companies are working on compliance schedules which involve construction to correct their particular problem. The cost of some of the installations that have been or are currently planned is significant. Since all the industrial users in the PVSC system are monitored for pH using our portable recorder, it is expected that we may identify other candidates for pH control equipment.

Sixty-six companies have installed effluent meters to more accurately measure the quantity of their wastewater discharge. Programs are being developed and will be implemented in the coming year to check the effluent meter calibrations so as to insure that the meter readings are correct.

VII. Compliance/Enforcement Activities - See Forms AR-7 and AR-8

The numerous problems experienced by companies in the PVSC district can be divided into the following categories:

1. Oil and Grease violations
2. Non-Solvent odor Complaints
3. Solvent odor complaints
4. pH violations
5. Pretreatment limitations violations
6. Other pollution complaints

The most action has been taken in the correction and control of pH violations as indicated by the number of companies that have installed pH recorders and/or pH control systems.

As stated previously, PVSC is completing the steps necessary to promulgate a Lower Explosive Limit (LEL) regulation. Five companies that use flammable materials have already installed monitoring equipment. In order to monitor and properly enforce the proposed LEL regulation, PVSC has designed and purchased on open flame type Lower Flammable Limit (LFL) recording meter. This recorder is unique as far as we can determine, and resulted from more than two years research. The terms LEL and LFL are interchangable. It is felt that this type of instrument will most accurately reflect the lower explosive limit of unknown mixtures of flammable materials. It is PVSC's plan to place the new instrument at a suspected violator in order to develop the evidence to require the company to install their own equipment. It is also the intent of PVSC to use the instrument to monitor companies that have already installed LEL recorders so that their performance can be evaluated.

One company, Witco Chemical in Paterson, is the latest to install a sophisticated solvent recovery system with built in redundancy to minimize solvent loss to the sewer.

There have been very few instances of oil and grease violations in our system. One company has installed two in line grease skimmers. The second grease skimmer was installed after it had been demonstrated that the first continuous belt skimmer did a less than satisfactory job. Even with the second skimming device in place, the company is still discharging excessive oil and grease. This company has retained a consultant to engineer and install a better system.

Another company has also installed a skimming device to keep any floatable grease from going into the sewer. They have also, as part of their spill prevention plan, installed a automatic shut-off gate at their sewerage outfall line which would trap any grease spillage on company property so that it could be removed and perhaps reclaimed and not allowed to flow into the sewer.

PVSC has been called by various municipalities for assistance whenever noxious odors were discovered coming from the sewer. In some cases, notably wintergreen odor originating from a company in Garfield, the problem was identified and a reasonable solution was found. In other cases, such as ammonia odors in Clifton, the problem is still open and will be re-investigated when and if it arises again. Because of the good relations enjoyed by PVSC with various municipal officials, we have been asked to assist in many types of problems. In those cases, when the problem was beyond the jurisdiction of PVSC the problem was referred back to the proper officials, such as NJDEP.

In the case of pollution complaints which contain a potential criminal nature, we have informed the State Hazardous Waste Strike Force or the appropriate County Prosecutor so that further action could be taken. A case in point was a company in Newark. Acting upon information supplied by PVSC, detectives from the Essex County Prosecutor's office, caught employees of this company dumping an acid material on the ground. This acidic material flowed along the ground and entered the municipal sewer through an opening in a manhole. As a result of this investigation, three company employees were indicted by the Grand Jury.

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
A.D.T. Co., Inc. 20 Bridewell Place Clifton, NJ 07014	NJD 049 934 726	3829 Protection devices	.028
A & F Electroplating 106 Ashland Avenue West Orange, NJ 07052	NJD 049 865 567	3471 Electroplating	.001
A.L. Dyers Inc. 36 Seabury Street Newark, NJ 07104	NJD [illegible] 796 166	~~2399~~ 2281 Synthetic Yarns	.016
A.T.&T. Technologies, Inc. Gateway Two Newark, NJ 07102	NJD _____	~~6512~~ 7332 Engineering and blue print mfg.	.070
Accurate Box Co., Inc. 86 Fifth Avenue Paterson, NJ 07509	NJD 002 144 319	~~2754~~ 2631 Paperboard cartons	.028
Acme Engraving 19 Delaware Avenue Passaic, NJ 07055	NJD [illegible]	2793 Engraved printing vehicles	.012
Adco Chemical 91-127 Rutherford Street Newark, NJ 07105	NJ [illegible]	2899 Alkyds varnishes, latex polymers	.009
Adson Electroplating 130 Whittlesey Avenue West Orange, NJ 07052	[illegible]	3471 Electroplating	.026
Aircraft Engineering Products Two Ackerman Avenue Clifton, NJ 07011	NJD 002 140 119	3728 Aircraft parts	.002
Alcaro & Alcaro 112 Pine Street Montclair, NJ 07042	NJD [illegible] 259 8.5	3471 Electroplating	.012

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Alfred Heller Heat Treating Company 5 Wellington Street Clifton, NJ 07014		~~3399~~ 3398 Commerical heat treating	.006
All Metal Polishing & Plating Co. 8 Avenue B Newark, NJ 07114		3471 Electroplating	.007
Allen Laundry & Services Inc. 971 East 24th Street Paterson, NJ 07513		7219 Laundry - linens	.017
Alliance Chemicals 33 Avenue P Newark, NJ 07105		2816 Organic intermediates	.105
American Electro Plating Corp. 342 Lincoln Avenue Hawthorne, NJ 07506		3471 Electroplating	.005
American Rendering Corp. 38-42 Bay Avenue Newark, NJ 07105		2077 Tallow, meat and bone meal	.005
Amtech, Inc. 845 East 25th Street Paterson, NJ 07513		3566 Gearmotors and transmission components	.023
Andarn Electro Service 72 Michigan Avenue Paterson, NJ 07503		~~3471~~ 3479 Aluminum etching and cleaning	.007
Anheuser Busch Inc. 200 U.S. Highway No. 1 Newark, NJ 07101		2082 Beer	3.216
Anodizing Corp. 39 Avenue L Newark, NJ 07105		3471 Anodizing of aluminum	.010

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Apollo Dyeing and Finishing Corp. 140 Summer Street Paterson, NJ 07501	NJD 049 8[illegible]	2262 Cotton and synthetics dyeing & finishing	.168
Applikay Textile Process Corp. 35 Eighth Street Passaic, NJ 07055	NJD 002 15[illegible]	2261 Textile printing & finishing	.021
Arrow Fastners Inc. 271 Mayhill Street Saddle Brook, NJ 07662	NJD [illegible] 195 [illegible]	3471 Staples and staple machine	.236
Art Metal USA Inc. 300 Passaic Street Newark, NJ 07101	NJD 02[illegible] 189 [illegible]	~~2541~~ 2542 No Steel office furniture	.050
Ashland Chemical Co. 221 Foundry Street Newark, NJ 07105	NJD 000 80[illegible]	5161 Industrial chemicals & solvents	.006
Atlantic Casting Engineering 80 Bloomfield Avenue Clifton, NJ 07012	NJD 002 158 [illegible]	3369 Non-ferrous casting	.010
Atlantic Chemical Corp. 10 Kingsland Road Nutley, NJ 07110	NJD 002 177 [illegible]	2869 Dyestuffs	.800
Atlas Refinery 143 Lockwood Street Newark, NJ 07105	[illegible]	2843 Lubricants	.020
Auric Fidelity Corp. 470 Frelinghuysen Avenue Newark, NJ 07114	NJD 002 189 [illegible]	2842 Metal cleaners and liquid concentrates	.001
Aurilyte Process Company 25 McWhorter Street Newark, NJ 07105	NJD 002 [illegible]	3471 Electroplating	.011

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Automatic Electroplating 185 Foundry Street Newark, NJ 07105		3471 Electroplating	.048
B Line Trucking Corp. 67 Esther Street Newark, NJ 07105		7699 Tank truck washing	.005
Baltic Dyeing & Finishing Inc. 35 Eighth Street Passaic, NJ 07055		2269 Dyer and finishing service industry	.058
Barber Photographic 378 Sixth Avenue Newark, NJ 07107		7395 Black & white photography	.010
Barnert Memorial Hospital Assn. 680 Broadway Paterson, NJ 07514		8062 Hospital	.062
Basic Concepts LTD. 141 Lanza Avenue Garfield, NJ 07026		3645 Electric lighting fixtures	.015
Batteries For Industries, Inc. 247 Fulton Street Paterson, NJ 07501		3691 Industrial batteries & chargers	.005
Beecham Products 65 Industrial South Clifton, NJ 07012		2844 Cosmetics, over the counter drugs	.143
Belzak Corp. 830 Bloomfield Avenue Clifton, NJ 07012		2865 Sodium glucoheptonate	.035
Benjamin Moore & Co. 134 Lister Avenue Newark, NJ 07105		~~2581~~ 2851 Paints	.063

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Bermelon Inc. 225 Pacific Street Newark, NJ 07114		2011 Abattoir	.061
Bessemer Processing 135 Haynes Avenue Newark, NJ 07114	NJD [illegible]	5085 Steel drum reconditioning	.044
Best Plating & Polishing 443 South Tenth Street Newark, NJ 07103	NJD 002 [illegible]	3471 Plating	.003
Best Provisions 144 Avon Avenue Newark, NJ 07108	NJD 002 [illegible]	2011 Frankfurters,corned beef, pastrami, and roast beef	.044
Beth Israel Hospital 70 Parker Avenue Passaic, NJ 07055	NJD [illegible]	8062 Hospital	.077
Biltmore Laundry Service 95 East 20th Street Paterson, NJ 07513	NJD [illegible]	7219 Commerical laundering of textiles	.020
Blue Line Inc. 209 Parkhurst Street Newark, NJ 07114	NJD [illegible]	3471 Recycled auto bumpers	.029
Bogue Electric Manufacturing Company 100 Pennsylvania Avenue Paterson, NJ 07509	NJD 002 [illegible]	3621 Motors and generators	.010
Biocraft Labs, Inc. 92 Route #46 Elmwood Park, NJ 07407	NJ [illegible]	2834 Mfg. pencillin preparations	.UND
Boris Kroll Dyeing Company 41 State Street Paterson, NJ 07524		2269 Textiles	.083

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Bright Star Industries Inc. 600 Getty Avenue Clifton, NJ 07015	NJD [illegible]	3692 Flashlights & batteries	.065
Brightboy Abrasives 351-365 Sixth Avenue Newark, NJ 07107	NJD [illegible]	~~2899~~ 3291 Abrasive wheels, rods and sheets	.028
C. A. Lausberg & Sons Inc. 351 Clinton Street Haledon, NJ 07508	NJD [illegible]	3552 Machine shop	.002
C. E. Lummus Company 1515 Broad Street Bloomfield, NJ 07003	NJD [illegible]	8911 Engineering pilot plant work	.070
C. Patti Electroplating 27 First Street Newark, NJ 07107	NJD [illegible]	3471 Electroplating	.013
Calgon Corp. 200 Wagaraw Road Hawthorne, NJ 07507	NJD 091 859 [illegible]	2819 Polymers, slimicides chemical and catalyst	.400
Canrad Hanovia 100 Chestnut Street Newark, NJ 07105	NJD [illegible]	~~3699~~ 3641 Ultraviolet lamps and equipment	.079
Celanese Chemical Corp. 354-375 Doremus Avenue Newark, NJ 07105	NJD [illegible]	2869 Formadehyde	.075
Cellomer Corp. 46 Albert Street Newark, NJ 07105	NJD [illegible]	2821 Alkyd resisn & photo sensitive chemicals	.043
Central Uniform Services 137 Ralph Street Belleville, NJ 07109	NJD [illegible]	~~3582~~ 7213 Laundry service	.021

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Certified Metals Corp. ~~390 Park Avenue~~ 175 Entin Rd Clifton, NJ 07014	NJD 002 195 394	3911 Gold wedding rings	.018
Champion Dyeing & Finishing Company 192 Putnam Street Paterson, NJ 07524	NJD [illegible]	2262 Dye acetates, nylons and polycottons	.066
Charles Besseler & Company 219 South 18th Street East Orange, NJ 07018	NJD 002 174 258	3861 Audio-visual photographic equipment	.023
Chase Chemicals 280 Chestnut Street Newark, NJ 07105	NJD 053 52[illegible]	2834 Vitamin tablets and gelatin capsules	.092
Chem Fleur Inc. 20 Pulaski Street Newark, NJ 07105	NJD 002 144 [illegible]	~~2818~~ 2819 Ergenol & cyclohexyl acetate	.146
Chemical Leaman Tank Lines Inc. 80 Doremus Avenue Newark, NJ 07105	NJ [illegible]	7699 Tank line service	.026
Chemical Leaman Tank Lines, Inc. 10 Morton Street East Rutherford, NJ 07070	NJD [illegible]	4213 Tank line service	.007
Chemos Corp. 225-235 Emmet Street Newark, NJ 07114		~~2841~~ 2842 Textile & leather finishing compounds	.100
Chrome Art Inc. 23 George Street Newark, NJ 07105	[illegible]	3471 Electroplating	.007
Church & Company 400 J.F.K. Drive Bloomfield, NJ 07003	NJD 002 140 157	3911 Jewelry mfg.	.002

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Clara Maass Hospital One Franklin Avenue Belleville, NJ 07109	NJ [illegible]	8062 Hospital	.091
Clinton Milk Company 353 Morris Avenue Newark, NJ 07103	NJ [illegible]	2026 Milk, cream & fruit drinks	.032
Coca Cola Bottling Co. 470 Nineteenth Avenue Paterson, NJ 07504	Att: Menela Sotell 701 Jefferson Rd Parsippany, NJ 07054 NJD 040 751 141	2086 Carbonated soft drinks	.263
College of Medicine & Dentistry 100 Bergen Street Newark, NJ 07103	NJD 247 700 711	8062 Hospital	.164
Colloids Inc. 394 Frelinghuysen Avenue Newark, NJ 07114	NJD 002 155 505	2869 Deformer chemicals	.142
Columbia Textile Service, Inc. 28 Ryle Avenue Paterson, NJ 07509		2261 Dyed material	.321
Columbus Hospital 490 North 13th Street Newark, NJ 07107	[illegible]	8062 Hospital	.164
Comet Chemical 410 Adams Street Newark, NJ 07114	NJ [illegible]	2851 Lacquer, thinners & water-based leather finishes	.002
Comet Finishing 272 Wright Street Newark, NJ 07114	NJD [illegible]	3471 Bright & dull nickel plating	.006
Como Textile Prints, Inc. 191 East Railway Avenue Paterson, NJ 07503	NJD 002 53 243	2261 Printing on natural & synthetic fibers	.168

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Consolidated Laundries 12 Clifton Street Newark, NJ 07104	NJD 044 65 [illegible] 172	7213 Laundry	.090
Consolidated Rail Corp. Conrail 91 Bay Avenue Cor. Wheeler Pt. Road Newark, NJ 07105	[illegible]	7699 Engine house	.008
Continental Can Company 217 Brook Avenue Passaic, NJ 07055	NJD 002 159 097	3411 Metal containers	.045
Continental Chemical Corp. 270 Clifton Blvd. Clifton, NJ 07015	NJD 002 152 954	2814 Detergents & emulsifiers	.089
Continental Piece Dyeing & Finishing 15-19 First Avenue Paterson, NJ 07524	NJD 002 163 889	2299 Textile piece goods	.104
Cook & Dunn Paint Corp. 109 St. Francis Street Newark, NJ 07105	NJD 002 154 174 161-67 Kossuth St Newark, NJ 07105	2851 Paints & varnishes	.003
Coral Dyeing & Finishing Company 585 East 31st Street Paterson, NJ 07513	NJD 002 152 432	2261 Dyed greige goods	.164
Courtaulds C.P.D., Inc. 290 Ferry Street Newark, NJ 07105		3079 Plastic sheet & film	.162
Craft Textile Printing Co., Inc. 44 Beech Street Paterson, NJ 07509	NJD 002 149 714	2261 Printing on textiles	.348
Crompton Knowles Corp 52 Amsterdam Street Newark, NJ 07105	NJD 000 694 190	2865 Dyes	.060

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Crouse Hinds Lighting 84 Foundry Street Newark, NJ 07105		~~2499~~ 3354 Aluminum poles	.020
Crown Monarch Inc. 44 St. Francis Street Newark, NJ 07105	NJD 002 458 602	3999 Fur pelts dressed & dyed	.011
Cummins Metro Power Routes 1 & 22 Newark, NJ 07114	NJD 001 060 950	7538 Repair & service of diesel engines	.007
Custom Optics 216 Midland Avenue Saddle Brook, NJ 07662	NJD 074 322 729	3851 Eye glass lenses	.020
D.S. Plumb Co. 73-77 Norfolk Street Newark, NJ 07101	NJD 002 167 264	3829 Water meter registers and switches	.009
Daytona Finishing Corp. 59 Wall Street Newark, NJ 07105	NJD 160 [illegible] 040	3471 Cold rolled steel	.025
Delsaco Foods Inc. 164 Madison Street East Rutherford, NJ 07073	NJD 054 050 141	~~2098~~ 2035 Salads and salad dressing	.363
Diamond Hard Chromium 463 New Jersey Railroad Avenue Newark, NJ 07105	NJD [illegible] 906	3471 Hard chrome plating	.0005
Diamond Shamrock Chemicals Co. A subsidiary of Diamond Shamrock Corp. First & Essex Streets Harrison, NJ 07029	NJD 077 557 644	2833 Specialty chemicals, vitamins and supplements	.300
Double D Plating Inc. 52 Garfield Avenue Paterson, NJ 07522	NJD [illegible]	3471 Electroplating and metal finishing	.024

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Drew Chemical 1106 Harrison Avenue Kearny, NJ 07029	NJD 053 518 530	2899 Industrial type water treatment products	.051
Driver Harris Corp. 201 Middlesex Street Harrison, NJ 07029	NJD 002 181 386	3356 Wire & nickel strips	.131
Duralite Co., Inc. Two Barbour Avenue Passaic, NJ 07055	NJD _____	~~3490~~ 3354 Tubular aluminum products	.051
Durite Circuit Corp. 141 River Road Nutley, NJ 07110	NJD 030 330 370	3679 Printed circuit boards	.004
Dyetex Corp. Two Canal Street Passaic, NJ 07055	NJD 089 216 [illegible]	2257 Fabric dyers	.197
E & W Piece Dye Works, Inc. 900 Passaic Avenue East Newark, NJ 07029	NJD 002 176 444	2262 Dye casket lining	.021
E. C. Electroplating 125 Clark Street Garfield, NJ 07026	NJD [illegible] 3	3471 Chrome and copper electro-plating	.015
Eagle Affiliates Div of APL 505 Manor Avenue Harrison, NJ 07029		3079 Plastic housewares	.088
Earthline Inc. (Div. SCA Chemicals) 100 Lister Avenue Newark, NJ 07105	NJD 089 216 790	4953 Commerical waste treatment facility	.057
East Orange General Hospital 300 Central Avenue East Orange, NJ 07019	NJD 007 521 070	8062 Hospital	.068

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Eastman Kodak 16-31 State Hwy #208 Fairlawn, NJ 07410	NJD 011 256 914	7395 Processed color slides and movies	.224
Edmar Creations 35 Mohegan Street Clifton, NJ 07013	NJD 001 324 474	3999 Casting, plating, welding and stamping	.016
Ekco Products 17-31 State Hwy #208 Fairlawn, NJ 07410	NJD 072 706 708	7699 Cleaning and reglazing baking pans	.036
Elan Chemical 268 Doremus Avenue Newark, NJ 07105	NJD 042 895 680	2899 Flavor & fragrance chemicals	.126
Electronic Circuit Corp. 520 Victor Street Saddle Brook, NJ 07662	NJD 002 140 827	3679 Printed circuit board	.008
Electronic Processing Corp. 17 Central Avenue Hawthorne, NJ 07506	NJD [illegible] 749 335	3471 Electroplating	.012
Empire Dyeing Company 250 Belmont Avenue Haledon, NJ 07508	[illegible] 572 651	~~2281~~ 2269 Warp dyeing & printing	.057
Empire Overall Co., Inc. 18 Stephanie Avenue Elmwood Park, NJ 07407	NJD 011 220 423	7218 Laundry - uniforms	.010
Engelhard Ind. 429 Delancy Street Newark, NJ 07105	NJD 064 274 657	3339 Precious metals, catalyst & chemicals	.715
Engelhard Ind. One West Central Avenue East Newark, NJ 07029	NJD 002 141 484	~~3952~~ 3297 Specialty chemicals, refractory coating formulation metals	.037
Edson Tool Mfg Co. 457 County Rd 51 Belleville, NJ 07109	NJD 002 177 970		

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Essex Chemical Corp 330 Doremus Avenue Newark, NJ 07105	NJD 002 153 898	2819 Inorganic acids and salts	.058
Essex County Geriatrics Center 520 Belleville Avenue Belleville, NJ 07109	NJD 000 575 456	8062 Hospital	.068
Ever Ready Label Corporation 357 Courtlandt Street Belleville, NJ 07109	NJD 002 177 111	2751 Aluminum nameplates & pressure sensitive labels	.020
Excel IV Inc. 65 Leliarts Lane Elmwood Park, NJ 07407	c/o Missbrenner 211 Mt. Prospect Ave Clifton, NJ 07013 NJD 062 052 899	2753 Engraved copper rollers	.010
Express Container 105 Avenue L Newark, NJ 07105	NJD 002 150 605	2653 Corrugated boxes	.022
Faber Castell Corp. 41 Dickerson Street Newark, NJ 07107	NJD 002 187 110	3069 Erasers, rubberbands, and india ink	.066
Fabricolor Manufacturing Corp. 24½ Van Houten Street Paterson, NJ 07509	NJD 002 194 017	2865 Dyes	.130
Fairmont Chemical 117 Blanchard Street Newark, NJ 07105	NJD 002 151 322	2865 Dydrazine & diazo chemicals for blueprints	.325
Falstrom Company Falstrom Court Passaic, NJ 07055	NJD 002 180 438	3444 Cabinets, panels, covers, chassis & frames	.011
Farmers Feed Company 468 Raymond Blvd. Newark, NJ 07105	NJD 003 913 662	2041 Brewers dried grain	.024

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Farmland Dairies 520 Main Street Wallington, NJ 07057	NJD 008 965 7[illegible]	2026 Processed milk & milk products	.152
Federal Pacific Electric 150 Avenue L & Herbert Street Newark, NJ 07101	NJD [illegible]	3613 Electrical distribuiton control equipment	.154
Fischer Scientific Company One Reagent Lane Fairlawn, NJ 07410	NJD 004 362 059	2869 Chemical processing	.222
Frederick Gumm Chemical Company 538 Forest Street Kearny, NJ 07032	NJD 002 175 636	2899 Metal finishing specialties and cleaners	.002
Fritzsche, Dodge & Olcott 85 Third Street Clifton, NJ 07015	NJD 002 155 007	2099 Flavors & spices	.448
G & H Metal Finishers 282 Dakota Street Paterson, NJ 07503	NJD [illegible]	3471 Decorative chrome parts	.019
Galaxie Chemicals 26 Piercy Street Paterson, NJ 07524	NJD 001 077 [illegible]	2865 Organic azo pigments	.124
Gamma Dyeing and Finishing Corp. 44 Shady Street Paterson, NJ 07524	NJD [illegible]	2261 Dyeing & finishing cloth	.193
Garden State Paper Co., Inc. 950 River Drive Garfield, NJ 07026	NJD 084 011 477	2621 Newsprint manufacture	8.000
General Color Corp. 24 Avenue B Newark, NJ 07114	NJD 001 54[illegible]	~~2816~~ 2805 Insoluable organic pigments	.062

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
General Metal & Black Finishers 3 Alva Street Bloomfield, NJ 07003	NJ [illegible]	3471 Electroplating	.016
Georgian Contempos 100 Eighth Street Passaic, NJ 07055		3471 Lamps and tables	.008
Givaudan Corp. 125 Delawanna Avenue Clifton, NJ 07014	NJD 002 [illegible] 354	2833 Organic chemicals	2.878
Globe Products Co., Inc. 750 Bloomfield Avenue Clifton, NJ 07015	NJD 058 108 903	2033 Jellies, jams & pie fillings	.340
Gloube Manufacturing Company 300 First Street Harrison, NJ 07029	NJD [illegible] 192	~~3498~~ 3496 NJ Wire rings	.005
Gordos Corp. 250 Glenwood Avenue Bloomfield, NJ 07003	NJD [illegible]	3679 Mfg. reed switchers and relay devices	.006
Gotham Graphics 120 Park Avenue Lyndhurst, NJ 07071	NJD 001 682 970	2793 Engraving & lithographic plates	.005
Graver Co. - Graver Chem. Div. 72 Lockwood Street Newark, NJ 07105		2899 Powered ion exchange resins and precoats	.084
Great American Veal 42 Avenue L Newark, NJ 07105	NJD [illegible]	2011 Meat processors	.010
H & S Chemical Co., Inc. 54-74 Van Dyke Street Wallington, NJ 07057	NJD [illegible]	2865 Pigment intermediates, iron hydrate pigments and dispersion stearates	.016

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
H. K. Metal Craft Mfg. Corp. 35 Industrial Road Lodi, NJ 07644	NJD 001 929 226	~~3429~~ 3293 Gaskets & washers	.012
Harrison Baking Company 840 Jersey Street Harrison, NJ 07029	NJD 002 193 452	2051 Bread & bread products	.035
Hawthorne Spring Company 280 Ninth Avenue Hawthorne, NJ 07506	NJD 002 [illegible]	~~3481~~ 3493 Coil springs	.008
Heubach, Inc. 256 Vanderpool Street Newark, NJ 07114	NJD 002 190 627	~~2815~~ 2816 Aqueous manufacture of color pigments	.442
Hexcel Specialty Chemicals 205 Main Street Lodi, NJ 07644	NJD 010 963 924	~~2833~~ 2899 Additives, agents and acid cleaners	.056
Highland Electro Plating 63 Dayton Street Paterson, NJ 07509	NJD 002 447 944	3471 Plating and polishing	.007
Hilton-Davis Chemical Company 120 Lister Avenue Newark, NJ 07105	NJD 000 537 214	~~2815~~ 2865 Organic pigments & iron oxide pigments	.400
Hoboken Paints Inc. 40 Industrial Road Lodi, NJ 07644	NJD 001 371 538	2851 Latex paint	.001
Hoffmann La Roche 340 Kingsland Road Nutley, NJ 07110	NJD 002 91 211	2834 Pharmaceuticals & bulk vitamins	5.000
Honig Chemical & Processing Co. 414 Wilson Avenue Newark, NJ 07105	NJD 055 090 161	~~2818~~ 2819 Sodium acetate	.070

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Hooton Chocolate Corp. 355 Fifth Street Newark, NJ 07107	NJD 000537753	2066 Chocolate coatings, cookie drops, confectionery coatings	.188
Hospital Center of Orange 188 South Essex Avenue Orange, NJ 07051		8062 Hospital	.057
Humko Chemical Div. Witco Chem. 652 Doremus Avenue Newark, NJ 07105		2899 Fatty acids & derivatives	.435
Hummel Lanolin - Croda 185 Foundry Street Newark, NJ 07105	NJD 002 195 016	2299 Lanolin	.030
Hy-Grade Electroplating 35 Fourth Street Newark, NJ 07107	NJD [illegible]	3471 Electroplating	.003
ITT Avionics 100 Kingsland Road Clifton, NJ 07014	NJD 001 375 77	3661 Electronic communications systems	.443
ITT Avoinics 390 Washington Avenue Nutley, NJ 07110	NJD 058 112 947	~~3670~~ 3661 Electronic communications system - R&D	.006
ITT Defense Communications 492 River Road Nutley, NJ 07110	NJD [illegible]	~~3670~~ 3001 Electronic communications system - R&D	.042
Ideal Plating & Polishing 681 Main Street Belleville, NJ 07109	NJD [illegible]	3471 Electroplating	.024
Imperial Electroplating Company 52 Park Avenue Lyndhurst, NJ 07071	NJD 001 252 634	3471 Electroplating	.006

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Independence Plating Corp. 107 Alabama Avenue Paterson, NJ 07509	NJD 002 161 242	3471 Plating	.030
Indol Color Company Division Magruder Colors One Virginia Street Newark, NJ 07114	NJD	2865 Plastic-dry pigments & resins pulverized drums	.012
Industrial Hard Chromium 7 Rome Street Newark, NJ 07101	NJD 000 532 751	3471 Electroplating	.008
Inmont Corp. 150 Wagaraw Road Hawthorne, NJ 07506	NJD 002 165 771	2865 Organic colorants	.317
International Veiling Corp. 244 Hazel Street Clifton, NJ 07012	NJD 002 444 867	~~2213~~ 2262 Dyeing and finishing of laces & nets	.081
Interstate Dyeing & Finishing Company 35 Eighth Street Passaic, NJ 07055	NJD 002 [illegible] 935	2261 Textile piece goods	.041
J. L. Prescott Company 37 Eighth Street Passaic, NJ 07055	NJD 002 160 040	2841 Cleaning products, laundry and dishwashing	.074
J. Wiss & Sons 33 Littleton Avenue Newark, NJ 07107	NJD	~~2421~~ 3421 Scissors & shears	.177
Jersey State Chemical 255 Belmont Avenue Haledon, NJ 07508	[illegible]	2899 Textile finishing chemicals	.007
Jersey State Chemical Corp. 59 Lee Avenue Haledon, NJ 07508	255 Belmont Ave Haledon, NJ 07508 NJD	2899 Textile finishing chemicals	.140

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Kalama Chemicals, Inc. 290 River Drive Garfield, NJ 07026	NJ [illegible]	2865 Organic chemicals	.537
Kaysam Corp. 27 Kentucky Avenue Paterson, NJ 07503	NJ [illegible]	~~2499~~ 3143 Footwear	.032
Keystone Automotive Plating Company 24 Legal Street Newark, NJ 07114	NJ [illegible]	3471 Electroplating of automobile bumpers	.027
Kikuchi Color & Chemical Corp. 19 East Fifth Street Paterson, NJ 07524	NJ [illegible]	2816 Chrome yellow pigments	.010
Kingsland Barrel & Drum 308 Miller Street Newark, NJ 07114	NJ [illegible]	5085 Recondition steel drums	.018
Kohinoor Electro Plating Corp. 11 Paterson Avenue Wallington, NJ 07057	NJ [illegible]	3471 Electroplating	.015
Kohl and Madden Inc. 130 Gregg Street Lodi, NJ 07644	NJ [illegible]	2893 Ink printing	.032
Kohler Delicatessan Meats Inc. 57 Napolean Street Newark, NJ 07105	NJ [illegible]	2013 Provisions - cold cuts	.027
Kohnstamm & Company Bergen & Harrison Avenues Kearny, NJ 07029	NJ [illegible]	2087 Flavors	.040
Koppel Photo Engraving Company 153 Central Avenue Hawthorne, NJ 07507	NJ [illegible]	2753 Photo engraving post cards and brochures	.008

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Larter & Sons 88 Parkhurst Street Newark, NJ 07114	NJD 002 202 174	3911 Jewelry	.001
Launder Leasing Services Division of Manhattan Laundries 58 Gould Avenue Newark, NJ 07107	[illegible]	7219 Laundry - linens	.063
Lea & Perrins 15-01 Pollitt Drive Fairlawn, NJ 07410	NJD 001 329 101	2035 Meat sauces	.037
Leader Dyeing and Finishing 94 Madison Avenue Paterson, NJ 07509	[illegible] 101 966	2261 Textile processing	.418
Liberty Optical 380 Verona Avenue Newark, NJ 07104	NJD 002 151 207	3851 Optical frames	.024
Liberty Provisions 200 Piaget Avenue Clifton, NJ 07011	NJD 003 973 660	2013 Provisions - cold cuts	.019
Linden Packing Co. 324 Astor Street Newark, NJ 07114	NJD 002 169 404	2011 Abattoir	.164
Little Falls Alloys 171-191 Caldwell Avenue Paterson, NJ 07509	[illegible]	3356 Metal rolling	.018
Loisel Manufacturing Corp. 168 Eighth Avenue Paterson, NJ 07514	[illegible] 319 737	3471 Lamp components and accessories	.009
Magruder Color Corp. 1029 Newark Avenue Elizabeth, NJ 07201	NJD 011 510 542	2865 Organic pigments	.130

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POTW: Passaic Valley Sewerage Commissioners

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Manco Metal Finish 390 Park Avenue Newark, NJ 07107		3471 Plating	.007
Mann Kraft Corp. 1000 U.S. Highway #1 Newark, NJ 07114		2649 Corrugated cartons	.013
Manner Dyeing & Finishing Company 293 Morrissee Avenue Haledon, NJ 07508		2261 Textile piece goods	.030
Mara Polishing & Plating 105-107 Peddie Street Newark, NJ 07108		3471 Electroplating	.009
Marcal Paper Mills Inc. One Market Street Elmwood Park, NJ 07407		2611 Household paper products	6.257
Marriot In Flite Rt. 70-156 Port Street Newark, NJ 07114		5812 Food-Airline meals	.023
Material Processing Tech, Inc. 95 Prince Street Paterson, NJ		2834 Mfg. asprin free pain reliever	.001
McGraw Edison Battery Division 75 Belmont Avenue Belleville, NJ 07109		3692 Primary batteries	.206
Mechanics Uniform Rentals 740 Frelinghuysen Avenue Newark, NJ 07114		7218 Laundry - industrial garments mops & towels	.041
Medin Metal Technology 125 South Street Passaic, NJ 07055		3471 Anodizing aluminum parts	.012

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Metal Parts Processing 165 Delancy Street Newark, NJ 07105	NJD 002 149 797	~~3559~~ 3471 Deburring service	.005
Miles Labs, Inc. 193 Arlington Avenue Clifton, NJ 07015	NJD 002 [illegible] 639	~~2818~~ 2869 Enzymes	1.158
Miller & Sons 24 Belleville Avenue Belleville, NJ 07109	NJD 002 149 506	3471 Anodizing, electroplating and metal finishing	.058
Minnesota Mining Mfg. - 3M 500 Doremus Avenue Newark, NJ 07105	NJD 002 172 609	~~2892~~ 2891 Capseals - liquid & solid friction resins	.221
Minwax Co., Inc. 16 Cherry Street Clifton, NJ 07014	NJD 002 156 40[illegible]	~~2842~~ 2899 Concrete patch & patching plasters	.001
Missbrenner Prints Inc. 211 Mt. Prospect Avenue Clifton, NJ 07013	NJD 002 [illegible]	2261 Textile printing	.451
Mobay Chemical Corp. Harmon Color Division 550 Belmont Avenue Haledon, NJ 07507	P.O. Box 419 Hawthorne, NJ 07507 NJD 002 248 3[illegible]	2815 Organic pigments	1.200
Mona Industires 76 East 24th Street Paterson, NJ 07524	NJD 002 [illegible]	2843 Surfactants and specialty chemicals	.108
Montclair Community Hospital 120 Harrison Avenue Montclair, NJ 07042	NJD 0[illegible] 179 0[illegible]7	8062 Hospital	.016
Morris Paper Board Company 177 Third Avenue Paterson, NJ 07509	NJD _____	2631 Paperboard	.302

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Morton Chemical Company 335 McLean Blvd. Paterson, NJ 07504		2899 Dyestuffs	.450
Mothers Foods - Vita 80 Avenue K Newark, NJ 07105		2032 Borscht & gefilte fish	.045
Mottern Polishing & Plating Co. 242 South 12th Street Newark, NJ 07109		3471 Polishing & plating	.002
Mountainside Hospital Bay & Highland Avenues Glen Ridge, NJ 07042		8062 Hospital	.128
Moyer Plating 175 Christie Street Newark, NJ 07101		3471 Electroplating	.028
N.J. Laundry Div. Marriott Hotels 63 Second Avenue Paterson, NJ 07514		7219 Laundry - linens	.024
Nabisco, Inc. 2111 Hwy #208 & McBride Ave Fairlawn, NJ 07410	River Road & DeForest Avenue East Hanover, NJ 07936	2052 Cookies and crackers	.124
Napp Chemicals, Inc. 139 Main Street Lodi, NJ 07644		2833 Pharmaceuticals & fine chemicals	.083
Narrotex Corp. 245 Fourth Street Passaic, NJ 07055		2269 Narrow fabric textile dyers	.016
National Malting Company 9 Ann Street Paterson, NJ 07509		2083 Brewers malt	.025

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
National Standard Company 716 Clifton Avenue Clifton, NJ 07015	NJD 002 159 154	3316 High carbon strip & wire	.250
New Jersey Galvanizing Tinning Work 139 Haynes Avenue Newark, NJ 07114	NJD 002 176 193	3479 Steel galvanizing	.018
New Jersey Tanning 410 Frelinghuysen Avenue Newark, NJ 07114	NJD 002 176 907	3111 Tanning of cattlehides	.022
Newark Beth Israel Hospital 201 Lyons Avenue Newark, NJ 07112	NJD [illegible]	8062 Hospital	.106
Newark Boxboard 47 Blanchard Street Newark, NJ 07105	NJD 002 152 544 57 Freeman Newark, NJ 07105	2631 Paperboard	.350
Newark Morning Ledger Star Ledger Plaza Newark, NJ 07101	NJD 002 127 342	2711 Newspaper	.055
North American Philips Corp. One Westinghouse Plaza Bloomfield, NJ 07003	NJD [illegible]	3641 Lamps & lamp parts	.254
North Jersey Skein Dyeing Company 152 Putnam Street Paterson, NJ 07524	NJD [illegible]	2269 Dyed yarns	.008
Northern Feather Works 31-39 Backus Street Newark, NJ 07105	NJD [illegible]	2392 Pillows & comforters	.075
Nu-Craft Industries 33 Spring Street Paterson, NJ 07501	NJD 058 110 107	3471 Frames and ornaments for handbags	.010

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Nu-Tronic Circuit Co., Inc. 250 East 17th Street Paterson, NJ 07524	NJD [illegible]	3679 Printed circuit boards	.013
O.M.I. International 75 River Road Nutley, NJ 07110		~~2889~~ 2899 Metal plating salts, reclaim precious metals	.035
Ocean Leather 42 Garden Street Newark, NJ 07105	NJD 002461598	3111 Tanning & finishing of leather	.325
Okonite Company 959 Market Street Paterson, NJ 07509	[illegible]	3351 Insulated wire and cables	.348
Okonite Company Jefferson & Canal Streets Passaic, NJ 07055	NJD 00[illegible]55	3357 Insulated wire and cables	.029
Ondecker Metal Finishing 178-182 Emmet Street Newark, NJ 07105	NJD [illegible]	3471 Electroplating	.002
Orbis Products 55 Virginia Avenue Newark, NJ 07114	NJD 010 910 099	2865 Organic chemcials	.374
Orient Shimazaki Chemial Corp. 121 Tyler Street Newark, NJ 07114	NJD [illegible]	2269 Dyestuffs	.064
P.N.C., Inc. 115 East Centre Street Nutley, NJ 07110	[illegible]	3679 Printed circuits	.015
Pabst Brewing Company 400 Grove Street Newark, NJ 07106	NJD [illegible]	2082 Beer	1.426

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Panatomic Engraving Company 45 Hartmann Avenue Garfield, NJ 07026	NJD 001 627 720	2753 Photo engraving	.018
Pantasote Co., of N.Y. 26 Jefferson Street Passaic, NJ 07055	NJD 002 291 826	2821 P.V.C. flexible film & P.V.C. trays	.108
Paragon Dyeing & Finishing Company 73 Chadwick Street Paterson, NJ 07509	NJD 002 [illegible]	2262 Textile fabrics	.025
Paramount Plating 689 South 16th Street Newark, NJ 07101	NJD 002 179 646	3471 Electroplating	.011
Passaic Color & Chemical Company 28-36 Paterson Street Paterson, NJ 07501	NJD 002 153 [illegible]	2861 Dyestuffs	.014
Passaic General Hospital 350 Boulevard Passaic, NJ 07055	NJD 075 170 662	8062 Hospital	.053
Paterson Bleachery & Chemicals 207 East 15th Street Paterson, NJ 07524	NJD 002 185 288	2299 Bleach and dye raw stock	.065
Paterson Canning Company 35 Getty Avenue Paterson, NJ 07503	NJD 010 911 402	2086 Canned soda	.023
Paul's Dyeing Company One Main Street East Orange, NJ 07018	626 Orange St Newark, NJ 07107 NJD 011 519 964	2258 Dyed goods	.015
Peerless Tube Company 71 Locust Avenue Bloomfield, NJ 07003	NJD 002 171 122	3496 Mfg. metal tubes & cans	.025

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Penick Corp. 158 Mt. Olivet Street Newark, NJ 07114	NJD 991 2[illegible] 642	2833 Pharmaceuticals and stearates	.437
Perennial Printing Corp Two East 26th Street Paterson, NJ 07509	NJD [illegible] 62 5[illegible]	2261 Textile printing	.017
Phillips Mfg. 190 Emmet Street Newark, NJ 07101	NJD [illegible] 16[illegible]	3461 Buttons and badges	.004
Pitt Consol 191 Doremus Avenue Newark, NJ 07105	NJD 004 948 178	2869 Cresols & xylenols	.141
Plating City 347 Ferry Street Newark, NJ 07105	NJD [illegible] 024	3471 Electroplating	.012
Polaris Plating Corp. 200 Keen Street Paterson, NJ 07524	NJD 002 405 926	3471 Plating of hardware	.025
Polarome Manufacturing Co., Inc. 361 South Street Newark, NJ 07105	NJD [illegible]	2087 Flavor and fragrance chemicals	.025
Pope Chemical Company 33 Sixth Avenue Paterson, NJ 07524	NJD 002 520 582	2893 Pigments, vehicles and pigment dispersions	.356
Poughkeepsie Finishing Corp. 200 Clifton Blvd. Clifton, NJ 07013	NJD 062 02[illegible]	2262 Textile finishing	.181
Poughkeepsie Finishing Corp. 48 East 5th Street Paterson, NJ 07509	NJD [illegible] 000	2262 Textile fabrics from greige state	.120

Power [illegible]

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Precision Products Company Two Llewellyn Avenue Hawthorne, NJ 07506	NJD 053 523 072	~~3728~~ 3679 Printed circuit boards & copper clad laminates	.024
Precision Prototypes Inc. 255 Midland Avenue Garfield, NJ 07026	NJD 075 412 285	~~3471~~ 3679 Printed circuit boards	.005
Presto Lock Corp. 100 Outwater Lane Garfield, NJ 07026	NJD 050 [illegible]	3429 Luggage hardware	.450
Private Label Cosmetics 20-10 Maple Avenue Fairlawn, NJ 07410	NJD 00[illegible]398 791	2844 Mfg. perfumes	.UNK
Public Service Electric & Gas Company South 4th St & Passaic River Harrison, NJ 07029	NJD 000 574 012	4925 Manufacture utility gas	.202
Purex Corp. Two Wood Street Paterson, NJ 07524	NJD 045 056 066	2841 Detergents and bleaches	.185
Quality ~~Plating Co., Inc.~~ Metal Finishing Corp. 80 George Street Paterson, NJ 07503	1/14/85 952 NJD 089 206 940	3471 Plating	.003
Rainbow Dyeing & Finishing Corp. 20-21 Wagaraw Road Fairlawn, NJ 07410	NJD 064 304 280	2261 Dye and finish piece goods	.060
Ranno Electroplating, Inc. 280 Midland Avenue Saddle Brook, NJ 07662	NJD 00 474 063	3471 Plating of metal	.060
Redi Strip 46 Paris Street Newark, NJ 07105	NJD 053 817 714	~~3842~~ 2842 Paint and rust removal from metal parts	.002

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Renco Mfg. 20-21 Wagaraw Road Fairlawn, NJ 07410		2261 Fabric dyeing	.060
Rennie Mfg. & Finishing Corp. 12 Rennie Place Lodi, NJ 07644		3471 Electroplating	.017
Rent All Processors 265 Cortlandt Street Belleville, NJ 07109		7213 Laundry service	.071
Rentex Corp. 51 Schley Street Garfield, NJ 07026		7218 Industrial laundry - uniforms, wiping towels and mops	.038
Resistol Hats 53 Rome Street Newark, NJ		2371 Fur felt headwear	.016
Reyom Corp. 173 Christie Street Newark, NJ 07105		3471 Electroplating	.007
Riverside Coat & Linen Supply Company 179 Lafayette Street Paterson, NJ 07501	NJD 011 628 013	7211 Laundry - linens	.053
Roche Diagnostics One Franklin Avenue Belleville, NJ 07109		2831 Diagnostic kits	.047
Roman Adhesives, Inc. 5 Lawrence Street Bloomfield, NJ 07003	NJD 002 177 863	2891 Ready mix wallpaper adhesives	.003
Ronson Metals Corp. 45-65 Manufacturers Place Newark, NJ 07105		3356 Rare earth metals and alloy products	.049

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Route 17 Plating (Auto Bumpers Inc.) 112 River Road Clifton, NJ 07014	NJD 017 449 515	3471 Auto bumpers - plating	.030
S. B. Penick 530 New York Avenue Lyndhurst, NJ 07071	NJD 081 894 242	2833 Analgesic compounds, botanical & food extracts	.359
S. Neumann Leather Corp. 46 Johnson Street Newark, NJ 07105	NJD 002 176 570	3111 Tanning & finishing of leather	.015
S.G.L. Modern Creative 35 Market Street Elmwood Park, NJ 07407	NJD 002 [illegible]	3231 Decorate containers	.034
SICPA North America 25 McLean Blvd. Paterson, NJ 07514	NJD 098 359 995	2893 Printing inks	.017
Saddle Brook General Hospital 300 Market Street Saddle Brook, NJ 07662	NJD 045 600 335	8062 Hospital	.025
Sandoz Color & Chemicals Fairlawn Ave & Third Street Fairlawn, NJ 07410	Sandoz, Inc. Route #10 East Hanover, NJ 07936	~~2815~~ 2865 Specialty chemicals	.407
Sandvik, Inc. 1702 Nevins Road Fairlawn, NJ 07410	NJD 002 213 453 NJD 002 479 369	3545 Cutting tools & holders	.088
Scher Chemical Corp. Industrial West & Styertowne Road Clifton, NJ 07012	NJD 002 190 643	2869 Detergents & industrial chemical specialties	.049
Schering Corp. 60 Orange Street Bloomfield, NJ 07003	NJD 002 877 725	2834 Pharmaceuticals	.251

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Schiffenhaus Packaging Corp. 2013 McCarter Highway Newark, NJ 07104	NJD 002 190 676	~~2754~~ 2653 Corrugated containers and displays	.016
Sealtronics, Inc. 320 Colfax Avenue Clifton, NJ 07013	NJD 002 910 430	~~3662~~ 3679 No Hermetic seals	.053
Seton Leather Co. 849 Broadway Newark, NJ 07104	NJD [illegible]	3111 Finished leather	1.150
Sherwin Williams Brown Street & Lister Avenue Newark, NJ 07105	NJD 002 451 870	2851 Consumer & industrial coatings and thinners	.450
Shulton, Inc. 697 Route #46 Clifton, NJ 07015	NJD 002 190 304	2844 After shave lotion & stick deodorant	.091
Spectrachem Corp. 200 Sheridan Avenue Paterson, NJ 07502	NJD 042 909 036	~~2843~~ 2899 Textile printing inks	.004
Spencer Kellogg 390 Doremus Avenue Newark, NJ 07105	[illegible]	~~2820~~ 2821 Alkyd & polyester resins	.187
St. James Hospital 155 Jefferson Street Newark, NJ 07105	NJD 275 168 559	8062 Hospital	.072
St. Joseph's Hospital & Medical Center 703 Main Street Paterson, NJ 07503	NJD 064 279 623	8062 Hospital	.154
St. Mary's Hospital 125 South Center Street Orange, NJ 07050	NJD 075 [illegible] 547	8062 Hospital	.057

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
St. Mary's Hospital 211 Pennington Street Passaic, NJ 07055	NJD 065 804 [illegible]	8062 Hospital	.033
St. Michaels Hospital & Medical Center 208 Dr. Martin Luther King Blvd. Newark, NJ 07102	NJD [illegible]	8062 Hospital	.081
Standard Tallow Corp. 1215 Harrison Avenue Kearny, NJ 07032	NJD [illegible]	2077 Tallow, meat and bone meal	.081
Stanley Tools 140 Chapel Street Newark, NJ 07105	NJD 002 454 049	3423 Hammers & bars	.117
Stirrup Metal Co. 215 Emmet Street Newark, NJ 07101	NJD 002 136 661	~~3479~~ 3494 Air valves	.006
Stokely Van Camp, Inc. Industrial Products Foot of Sanford Avenue Kearny, NJ 07032	NJD 002 175 669	2077 Detergents & edible fat products	.720
Suffern Plating Corp. 210 Garibaldi Avenue Lodi, NJ 07644	NJD 002 109 233	3471 Electroplating	.036
Sun Chemical 185 Foundry Street Newark, NJ 07105	NJD 002 456 092	2865 Organic pigments	.080
Sun Metal Finishing, Inc. 54 Bleeker Street Paterson, NJ 07524	NJD 038 482 022	3471 Zinc plating	.022
Sun Plastics Co., Inc. 900 Passaic Avenue East Newark, NJ 07029	NJD 002 [illegible]	3652 Phonograph records	.031

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Sunbrite Dye Co., Inc. 35 Eighth Street Passaic, NJ 07055	NJD [illegible]	2269 Processed synthetic piece goods	.080
Superior Dyed Furs, LTD 100 Dayton Avenue Passaic, NJ 07055	NJD [illegible]	2371 Fur dyeing	.014
Supreme Santell Linen Company 124 Delancy Street Newark, NJ 07105	NJD 000 559 970	7213 Laundry - linen	.031
Swepco Tube Corp. One Clifton Blvd. Clifton, NJ 07015	NJD [illegible]	3356 Stainless steel pipe, fittings & tubing	.047
T & E Industries 422 Alden Street Orange, NJ 07050	NJD [illegible]	~~3229~~ 3679 Electronic terminals and connectors	.010
T. A. Farrell Electroplating 39 Atlantic Street Garfield, NJ 07026	NJD [illegible]	3471 Electroplating	.022
Technical Plastic Extruders Inc. 574 Ferry Street Newark, NJ 07105		3079 PVC plastic - sheet and rolls	.035
Textile Piece Dyeing Inc. 451 Fifth Avenue Paterson, NJ 07509	[illegible]	2261 Dyer of textiles	.344
Thomas Henshall Silk Finishing Co., Inc. 52 West Peel Street Paterson, NJ 07524	NJD [illegible]	2261 Textile finishing	.008
Tiffany Co. 820 Highland Avenue Newark, NJ 07104	NJD [illegible]	3914 Mfg. silverwares stationery	.037

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Timco Inc. 666 South 16th Street Newark, NJ 07103	NJD 011 5[illegible]	3479 Plating	.002
Trio Dyeing Company, Inc. 440-450 East 22nd Street Paterson, NJ 07509	NJD [illegible]	2261 Dye & finish textile goods	.420
Trio Plating Co., Inc. 61 Willett Street Passaic, NJ 07055	NJD 010 905 428	3471 Copper & chrome plating	.001
Troy Chemical One Avenue L Newark, NJ 07105	NJD 071 177 869	2879 Chemicals for paint industry	.022
Union Camp Corp. 800 State Hwy #3 Clifton, NJ 07012	NJD 002 159 812	~~2605~~ 2641 Custom packaging, folding cartons & labels	.006
Union Photo Company 1240 Main Avenue Clifton, NJ 07015	NJD 011 632 866	7395 Photo finishing	.030
United Hospitals Medical Center 15 South Ninth Street Newark, NJ 07107	NJD 010 827 560	8062 Hospital	.076
United Hospitals Orthopedic Center 89 Park Avenue Newark, NJ 07102	NJD [illegible]	8062 Hospital	.010
Universal Grain of N.J. 425 South Street Newark, NJ 07105	NJD 008 913 048	2082 Brewers grains	.010
Universal Manufacturing Corp. 29-51 East Sixth Street Paterson, NJ 07509	NJD 002 201 614	~~3351~~ 3612 Fluorescent ballasts	.107

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Van Dyke & Company Main & Williams Streets Belleville, NJ 07109	NJD 002 146 504	2844 Perfume, chemicals & compound specialties	.187 ✓
Van Iderstine Corp. 825 Wilson Avenue Newark, NJ 07105	NJD 002 566 733	2077 Tallow & meat meal	.102 ✓
Van Ness Plastic Molding Company 555 Cortlandt Street Belleville, NJ 07109	NJD 002 150 902	3079 Plastic pet supplies	.073 ✓
Victory Optical Co. ~~9 Mulberry Place~~ Newark, NJ 07102 1 Victory Plaza	NJD 002 189 868	3851 Eyeglass frames	.036 ✓
Videx Corp. 170 Railroad Avenue Paterson, NJ 07501	NJD 011 883 444	3542 Rebult extrusion machinery	.001 ✓
Wallace & Tiernan 25 Main Street Belleville, NJ 07109	NJD 002 461 234	3829 Measurement & control equipment	.181 ✓
Warner Mfg. Company 100 Third ~~Street~~ Ave. Kearny, NJ 07032	NJD 930 773 857	3354 Fabricaters & extrudes of aluminum and direct chill casting of aluminum	.001 ✓
West Hudson Memorial Hospital 206 Bergen Avenue Kearny, NJ 07032	NJD 004 971 562	8062 Hospital	.036 ✓
Weston Instruments Div. Sangamo Weston 614 Frelinghuysen Avenue Newark, NJ 07114	NJD 002 141 794	~~3611~~ 3829 Thermometers & aerospace indicators	.075 ✓
Westwood Lighting Group 177 Genesse Avenue Paterson, NJ 07503	NJD 067 507 368	3645 Lamps	.027 ✓

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
White Chemical Company 646 Frelinghuysen Avenue Newark, NJ 07114	NJD 980 755 623	~~2833~~ 2869 Acid chlorides, brominated flame retardants	.012
White Metals Manufacturing Corp. 220 Goffle Road Hawthorne, NJ 07506		3499 Metal container tubes	.100
Witco Chemicals (Ultra Division) Two Wood Street Paterson, NJ 07524	NJD 002 163 350	2841 Detergents and allied chemicals	.091
Worthington Pump Corp. 401 Worthington Avenue Harrison, NJ 07029	NJD 067 484 998	3561 Pumps & machinery	.242
Yeast Products 25 Styertowne Road Clifton, NJ 07012	NJD 002 180 891	2099 Brewers yeast	.100
Zenith Dyeing & Finishing Corp. 53 East 23rd Street Paterson, NJ 07509	NJD 002 159 533	2261 Textile dyeing and finishing	.025

NEW JERSEY POLLUTANT DISCHARGE ELIMINATION SYSTEM

The New Jersey Department of Environmental Protection hereby grants you a NJPDES permit for the facility/activity named in this document. This permit is the regulatory mechanism used by the department to ensure your discharge will not harm the environment. By complying with the terms and conditions specified, you are assuming an important role in protecting New Jersey's valuable water resources. Your acceptance of this permit is an agreement to conform with all of its provisions when constructing, installing, modifying, or operating any facility for the collection, treatment, or discharge of pollutants to waters of the state. If you have any questions about this document, please feel free to contact the department representative listed in the permit cover letter. Your cooperation in helping us protect and safeguard our state's environment is anticipated and appreciated.

PERMIT NUMBER NJ0108758

Permittee	Co-Permittee
NEWARK CITY OF CITY HALL ROOM B331F 920 BROAD STREET NEWARK NJ 07102	
Property Owner	**Location of Activity**
NEWARK CITY OF CITY HALL, ROOM NO B31F 920 BROAD STREET NEWARK NJ 07102	NEWARK CITY OF CITY HALL ROOM B31F 920 BROAD STREET NEWARK NJ 07102

Current Authorization Covered By This Approval And Previous Authorization	Issuance Date	Effective Date	Expiration Date
CSO:COMBINED SEWER OVERFLOW (GP)	02/28/2000	02/29/2000	02/28/2005

By Authority of:

DEP AUTHORIZATION

Stanley V. Cach Jr., PE, PP
Chief, Bureau of Engineering North

(Terms, conditions and provisions attached hereto)

KLL037670

NJPDES/DSW PERMIT NUMBER NJ0108758
INDIVIDUAL AUTHORIZATION PAGE CONTINUED

This individual general permit authorization authorizes the City of Newark to operate a combined sewer system for the collection and conveyance of wastewater and to discharge untreated wastewater in the form of combined sewer overflows from the combined sewer overflow points listed on the Table CSO-I, in accordance with terms and conditions of the General Permit for Combined Sewer Systems NJPDES Permit No. NJ0105023.

Table CSO-I

001	Meadowbrook	40°47'17"	74°10'17"	Second River
002	Verona Avenue	40°46'07"	74°09'06"	Passaic River
003	Delavan Avenue	40°46'07"	74°09'27"	Passaic River
004	Herbert Place	40°45'57"	74°09'34"	Passaic River
005	Herbert Place	40°45'57"	74°09'34"	Passaic River
006	Oriental Avenue	40°45'34"	74°09'53"	Passaic River
007	Third Avenue	40°45'28"	74°09'55"	Passaic River
008	Fourth Avenue	40°45'22"	74°09'56"	Passaic River
009	Clay Street	40°45'03"	74°09'58"	Passaic River
010	Clay Street	40°45'03"	74°09'58"	Passaic River
011	Orange Street	40°44'47"	74°10'01"	Passaic River
012	Bridge Street	40°44'42"	74°10'01"	Passaic River
013	Rector Street	40°44'29"	74°09'56"	Passaic River
014	Saybrook Place	40°44'26"	74°09'54"	Passaic River
015	City Dock	40°44'07"	74°09'45"	Passaic River
016	Jackson Street	40°43'59"	74°09'19"	Passaic River
017	Polk Street	40°43'58"	74°09'10"	Passaic River
018	Freeman Street	40°44'03"	74°08'46"	Passaic River
019	Brown Street	40°44'26"	74°08'19"	Passaic River
020	Lockwood Street	40°44'03"	74°07'53"	Passaic River
021	Blanchard Street	40°44'30"	74°07'40"	Passaic River
022	Roanoke Avenue	40°43'34"	74°07'17"	Passaic River
023	Adams Street	40°42'42"	74°10'12"	Peripheral ditch
024	Wheeler	40°42'49"	74°10'47"	Peripheral Ditch
025	Peddie Street	40°42'36"	74°11'06"	Peripheral ditch
026	Queen	40°42'20"	74°11'12"	Peripheral ditch
027	Waverly	40°41'25"	74°11'26"	Peripheral ditch
028	Haynes Avenue	40°42'23"	74°11'00"	Peripheral Ditch
029	Waverly	40°41'25"	74°11'26"	Peripheral Ditch
030	Avenue A	40°42'49"	74°10'47"	Peripheral Ditch

ROBERT J. DAVENPORT
CHAIRMAN

CHARLES A. LAGOS
VICE CHAIRMAN

THOMAS J. CIFELLI
VINCENT CORRADO, SR.
KENNETH W. HAYDEN
DONALD TUCKER
COMMISSIONERS

Passaic Valley
Sewerage Commissioners

600 WILSON AVENUE
NEWARK, N. J. 07105
(201) 344-1800

CARMINE T. PERRAPATO
EXECUTIVE DIRECTOR

JAMES M. PIRO
CHIEF COUNSEL

NORMAN E. DARMSTATTER
CLERK

September 18, 1987

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. William Boehle, Section Chief
Industrial Pretreatment Program
Water Quality Management
New Jersey Department of Environmental Protection
P.O. Box CN 029
Trenton, New Jersey 08625

RE: PRETREATMENT PROGRAM ANNUAL REPORT NUMBER 4

Dear Mr. Boehle:

Enclosed is the fourth annual report submitted by Passaic Valley Sewerage Commissioners to your agency. This report covers the one year period from August 1, 1986 through July 31, 1987. As in the past, we will be available to meet with your staff to answer questions or discuss continued efforts to improve this document.

Please direct any inquiries in reference to this report to Frank D'Ascensio.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Carmine T. Perrapato,
Executive Director

CTP/mc

cc: Frank D'Ascensio
Richard Baker

RECEIVED
SEP 21 1987
STATE OF NEW JERSEY
DEPT. ENVIRONMENTAL PROTECTION
DIVISION WATER RESOURCES
BUR. OF IND. WASTE MGMT.

KLL038645

ANNUAL POTW PRETREATMENT PROGRAM

REPORT OUTLINE

JULY 1987

State of New Jersey
Department of Environmental Protection
Division of Water Resources
Industrial Pretreatment Section
CN-029 Trenton, NJ 08625

AR-1

INDUSTRIAL PRETREATMENT PROGRAM ANNUAL REPORT

NJPDES Permit Holder or Sewer Authority Name: Passaic Valley Sewerage Commissioners

Report Date: September 18, 1987

Period Covered by This Report: from 8/1/86 to 7/31/87

Period Covered by Previous Report: from 8/1/85 to 7/31/86

Name of Wastewater Treatment Plant(s)	NJPDES Permit Number
Passaic Valley Sewerage Commissioners	0021016

Person to contact concerning information contained in this report:

Name: Frank P. D'Ascensio

Title: Manager of Industrial & Pollution Control

Mailing Address: 600 Wilson Avenue

Newark, New Jersey 07105

Telephone No.: (201) 344-1800

I have personally examined and am familiar with the information submitted in this document and attachments. Based upon my inquiry of those individuals immediately responsible for obtaining the information reported herein, I believe that the submitted information is true, accurate and complete.

Date: September 18, 1987

Signature of Official

Executive Director
Title

PRETREATMENT PROGRAM ANNUAL REPORT NUMBER 4

AUGUST 1, 1986 THROUGH JULY 31, 1987

II **Table of Contents** - Not Used

III **Report Summary**

In our previous report we discussed the delay experienced by Seton Company in getting appproval from the City of Newark for construction of the line required as part of its sulfide waiver. It appeared after considerable followup that the line was going to be delayed, probably through 1987. With this in mind, the Commissioners will be discussing the matter at their August meeting. Legal action may be taken to rescind the waiver for the new line and to require Seton Company to take alternate means to meet the pretreatment limitations as quickly as possible.

On April 16, 1987, the Commissioners approved the purchase of a portable gas chromatograph. This instrument will enable us to identify and quantify the sources of the various volatile organics. More importantly, it will help us determine whether the industrial users are the source of most of the volatiles discharged to the sanitary sewer. A permit modification from the Nuclear Regulatory Commission was not issued until July 2, 1987, and delivery is scheduled for August.

PVSC received notification that the Central Metal Recovery Facility did indeed begin operating on July 1, 1987. An existing company, Envirite, located in Connecticut, will regenerate the resin and recover the heavy metal. Since Recovery is the only way to keep the metals from becoming waste, we hope that the facility succeeds and that the federal agencies do more to promote recovery of toxic pollutants.

On August 3, 1987, PVSC received the Pretreatment Program Annual Report Review for the third annual report. The comments contained in that Review have been incorporated in this report and will be incorporated in future reports.

Department personnel have been working very hard on assembling the necessary information to identify the industrial users located in the communities that will be connecting to the PVSC system. Sewer Connection Applications have been distributed to about 285 users in Bayonne, Jersey City, Totowa and West Paterson. For many companies, this is the first time that they have been exposed to the federal regulations and PVSC representatives conducted seminars for Bayonne, Jersey City, Totowa and West Paterson users and municipal officals.

Early in 1987, PVSC upgraded its computer software with the purchase of an interactive database management program for use with the pretreatment system. We are in the process of developing the applications and expect to have the major one completed by the next annual report.

IV Industrial Inventory

See Form AR-2

Over the years the total number of industrial users has not changed drastically. However, we have seen the types of user change from the high water use, wet industries to low water use industries. Thus, the industrial portion of total volume has declined from 22% to 18%. The impact on the contribution from all the new communites cannot be predicted at this time.

Summary

(a)	number of categorical industries.....	166
(b)	number of significant/major non-categorical industries.....	117
(c)	number of other regulated non-categorical industries.....	72

V Compliance with Categorical Standards by Industrial Users

See Form AR-3, AR-4 and AR-4A

As can be seen, nearly all categorical users are in compliance. Legal action is either in progress or about to be instituted where non-compliance has been longstanding. This does not include those users whose semi annual reports have not been received as yet and may be out of compliance. Follow up violation letters have been sent to all who have not submitted the required report. We have included a sheet numbered 4A for those companies who would be covered by categorical standard if they had a discharge from the process, but at the present time they have a zero discharge from the process. These companies will be required to submit a certification of zero dishcharge on a semi-annual basis.

VI Monitoring Program

See Form AR-5a, AR-5b, AR-5c and AR-6

There are now 124 users that have installed 132 pH recorders and/or pH control systems as compared with 102 users last year. We have 3 portable pH recorders which are used to monitor discharges from users without pH control systems when we suspect that a pH problem exists.

We continue to use our LEL recorder to monitor discharges from users suspected of discharging flammable solvents. As described in Section III, we expect to receive a portable gas chromatograph in August, 1987. This instrument will enable us to identify and quantify the various volatile organics that are discharged to the sanitary sewer. This data will provide the basis for establishing a local limit for volatiles, if necessary.

All categorical users are required to submit semi-annual reports as contained in 40 CFR 403. Non-categorical users submit compliance reports also. We review the reports and have established a check off list which itemizes deficiencies. This is sent to a designated user with a form letter requiring corrective action. When a categorical user is following an extensive construction program, we require monthly status reports.

During the on site audit of our Pretreatment Program, we were asked to document heavy metal data to DEP. Although this information was submitted on August 20, 1987, we are including a copy in this report as well, since it covers a period of time through December 31, 1986. It documents substantial reductions in heavy metals.

PVSC monitors its influent and effluent daily for the conventional pollutants, while the sludge is monitored monthly. Monthly composites of influent, effluent and sludge are analyzed for heavy metals. Due to the extreme variability of the organics, as documented in the priority pollutant scan which was described in a previous annual report, we do not feel it is justified to spend large sums of taxpayer's money for organics analyses at this time. We hope that the portable gas chromatograph will fill in this information gap by identifying sources of volatiles. Analyses for the acid and base neutral fractions can be performed when a clear need arises. Finally, a quarterly bioassay is performed on the sludge. We have also included an updated analytical data summary (AR-5A) from the 1986 report. This update now includes data that was not available when the 1986 report was submitted. It is our plan to include this update in future reports if the AR-5A is incomplete.

With respect to categorical users, our goal is to visit each one at least yearly to conduct a compliance inspection of their instrumentation, records for the past month and observe operational changes or potential problems. During the onsite audit of our Pretreatment Program, we were asked to better document the comprehensive inspections which we conduct. Since that time we began using the recommended check off list on all comprehensive inspections. These comprehensive inspections will be conducted on an annual basis, with a goal to increase the frequency to semi-annually.

Concerning monitoring for compliance, we take annual 4 day composites for those users with heavy metal limits, whether categorical or non-categorical. Sampling for other parameters, such as cyanide or petroleum hydrocarbons, is done on an exception basis where the frequency of monitoring would vary from monthly to quarterly depending upon experience. If a violation is encountered, the frequency normally is increased.

VII Compliance/Enforcement Activities

See Forms AR-7 and AR-8

All local limit violations have either been corrected or the violators are under direction to install monitoring and control equipment. In addition to being directed to install appropriate pretreatment equipment, one company, Orval Kent is being back charged for labor and dumping fees while they continue to discharge excessive solids into the sewer. Data is being collected by the PVSC line crew on several other companies that are discharging excessive solids. In the event that back charging is not sufficient incentive to correct their problem, it may be necessary to recommend that legal action be taken against these companies in order to get them to comply.

There were 49 reporting violations during the reporting period. These violations were mostly from companies who were tardy in their submission or who after submitting their reports, had certain deficiencies that kept the reports from being complete. While there was little difference in the number of reporting violations from last year, this can be explained by a number of new companies that have had to submit compliance reports. This also applies to the increase in the State/Federal violations over last year. As companies become better educated on reporting requirements, we expect that this type of violation will decrease. There was significant improvement in reporting by companies that have been submitting reports for several years.

Two leather companies have opted to be regulated by the limits specified in 40 CFR 425 rather than by the provisions of the sulfide waiver granted by EPA to PVSC. EPA and NJDEP will be notified of their intent in writing. Therefore, for enforcement purposes, PVSC will follow the limits specified in the regulation. The other company, Seton Leather, is discussed in detail in the report summary.

In connection with the waiver granted by NJDEP for petroleum based oil and grease, PVSC began collecting data from one company on a weekly basis in order to justify the setting of a reasonable limit. After about three months of consistent results, we suddenly started getting much lower results. A full scale investigative program was initiated in an effort to resolve the discrepancy. This program is still ongoing.

As a result of our monitoring efforts a number of companies have been required to install cyanide destruct systems. In addition, companies that had installed cyanide destruct systems but did not have pH recorders to monitor the pH of their discharge on a continuous basis were required to do so. This accounts in part for the increase in pH recorder installations mentioned in the summary.

The new and more sophisticated Atomic Absorption Spectrophotometer was placed into service in October of 1986. This instrument has enabled our laboratory to produce metal analyses more quickly, thereby increasing the effectiveness of our enforcement actions. At present, users are only required to submit one anlaysis during a six month period to show compliance except in the case of chronic violators. We have also issued notices of violation on the basis of PVSC analysis results.

PVSC personnel continue to enjoy good support with other regulatory and law enforcement agencies.

VIII Program Evaluation

The best way to evaluate the success of a pretreatment program is to compare the quality of the influent to the POTW. The consistent reductions in influent heavy metals is one clear indication of the effectiveness of the pretreatment program. While the reductions have been substantial, we expect further reductions as some larger users fine tune their pretreatment processes. The large number of users with installed pH and LEL monitoring and control systems has had a beneficial effect on PVSC influent, though it is difficult to quantify exactly with a combined sewer system.

An excellent way to also evaluate the program is the likelihood of users notifying the POTW of problems that could go undetected at the POTW. One would expect that larger users, concerned with a public image, would be desirous of doing this. However, even though it is required by the PVSC Rules and Regulations, we did not expect the small users to do this also. It proves that the education process has worked. Some users have been required to dispose of waste offsite, through a licensed hauler, whereas they could have merely dumped the material into the sewer.

While the number of fines issued or enforcement actions commenced is not very high, it should not be construed that the pretreatment program is ineffective. One could reasonably state the opposite, that an effective program avoids these adverserial procedures. PVSC has recognized the effectiveness of fines as one of several tools to be used. At the request of EPA, PVSC is planning to request legislation to increase substantially the amount of the fines that it can assess.

One area of concern involves the ever increasing use of POTW for groundwater decontamination. PVSC is receiving requests almost weekly for the discharge of pretreated groundwater. Due to the DEP's concern for volatiles and lack of guidance from them, we have adopted a requirement for the use of carbon columns in nearly every case. The DEP should be concerned with the organics (especially the volatiles) that result from the pretreatment process and determine whether these pollutants are being properly disposed of when the carbon columns are regenerated.

Another area of concern is data management. The various regulatory agencies keep creating new programs in response to valid concerns. However, the recordkeeping and paperwork requirements also keep escalating. Even after separating old, outdated information, a file on a typical categorical user could be 6 inches thick. The sheer volume of paper to be examined by DEP officials during the annual audit was overwhelming. To handle the increasing load we recently purchased a more powerful database software package. We also have exceeded the 20 mb storage capacity of our computer/word processor and expect to increase the storage to 60 mb. PVSC is rather fortunate in being able to provide these systems, but a smaller POTW is probably suffering more. DEP could do more to streamline the flow of paper and focus on results.

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
A & F Electroplating Inc. 106 Ashland Avenue West Orange, NJ 07052		3471 Electroplating	.002
A & L Dyers Inc. 36 Seabury Street Newark, NJ 07104		2399 Synthetic Yarns	.006
A.D.T. Co., Inc. 20 Bridewell Place Clifton, NJ 07014		3829 Protection Devices	.015
A.T.&T. Technologies, Inc Gateway Two Newark, NJ 07102		6512 Engineering and Blue Print Manufacturing	.041
Accurate Box Co., Inc. 86 Fifth Avenue Paterson, NJ 07509	P.O. Box 2247 Paterson, NJ 07509	2754 Paperboard Cartons	.022
Acme Engraving Co., Inc. 19 Delaware Avenue Passaic, NJ 07055		2793 Engraved Printing Vehicles	.003
Adco Chemical Co. 91-127 Rutherford Street Newark, NJ 07105	P.O. Box 128 Newark, NJ 07105	2899 Alkyds Varnishes, Latex Polymers	.003
Aircraft Engineering Products Two Ackerman Avenue Clifton, NJ 07011		3728 Aircraft Parts	.005
Alcaro & Alcaro Plating Co., Inc. 112 Pine Street Montclair, NJ 07042	P.O. Box 1215 Montclair, NJ 07042	3471 Electroplating	.012
Alfred Heller Heat Treating Company 5 Wellington Street Clifton, NJ 07011-0330	P.O. Box 330 Clifton, NJ 07011-0330	3471 Commercial Heat Treating	.013

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Allan Finishing Corporation 271 Mayhill Street Saddle Brook, NJ 07662		3471 Staples and Staple Machines	.143
Allen Supply & Laundry Services Inc. 971 East 24th Street Paterson, NJ 07513		7219 Laundry - Linens	.020
Alliance Chemicals, Inc. 33 Avenue P Newark, NJ 07105		2816 Organic Intermediates	.059
Ambrosia Chocolate Div. of W.R. Grace & Co. 355 North Fifth Street Newark, NJ 07107		2066 Chocolate Coatings,Cookie Drops, Confectionery Coatings	.694
American Electro Plating Co. 342 Lincoln Avenue Hawthorne, NJ 07506		3471 Electroplating	.008
American Rendering Corp. 38-42 Bay Avenue Newark, NJ 07105		2077 Tallow, Meat and Bone Meal	.008
Amtech, Inc. 845 East 25th Street Paterson, NJ 07513		3566 Gearmotors and Transmission Components	.010
Andarn Electro Service, Inc. 72 Michigan Avenue Paterson, NJ 07503		3471 Aluminum Etching and Cleaning	.003
Anheuser Busch Inc. 200 U.S. Highway No. 1 Newark, NJ 07101		2082 Beer	2.660
Anheuser Busch Inc. 468 Raymond Blvd. Newark, NJ 07105		2041 Brewers Dried Grain	.004

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Anodizing Corporation 139 Avenue L Newark, NJ 07105	P.O. Box 5309 Ironbound Station Newark, NJ 07105	3471 Anodizing of Aluminum	.012
Apollo Dyeing and Printing Co. 140 Summer Street Paterson, NJ 07509	P.O. Box 3072 Paterson, NJ 07509	2262 Cotton and Synthetics Dyeing & Finishing	.071
Aratex Services, Inc. 740 Frelinghuysen Avenue Newark, NJ 07114		7218 Laundry - Industrial Garments Mops & Towels	.049
Architectual Metals 162-176 Abington Avenue Newark, NJ 07107		3471 Electroplating	.001
Armour Dial Corporation 179 Entin Road Clifton, NJ 07014		2842 Mfgs - Ammonia	.003
Art Metal USA Inc. 300 Passaic Street Newark, NJ 07101		2541 Steel Office Furniture	.053
Ashland Chemical Co. Div. of Ashland Oil, Inc 221 Foundry Street Newark, NJ 07105	2025 Lincoln Hwy Suite 232 Edison, NJ 08817	5161 Industrial chemicals & Solvents	.003
Atlantic Casting Engineering 810 Bloomfield Avenue Clifton, NJ 07012		3369 Non-Ferrous Casting	.010
Atlantic Industries, Inc. 10 Kingsland Road Nutley, NJ 07110		2869 Dyestuffs	.558
Atlas Metal Finishing, Inc 8 Avenue B Newark, NJ 07114		3471 Electroplating	.007

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Atlas Refinery, Inc. 142 Lockwood Street Newark, NJ 07105		2843 Lubricants	.007
Auric Fidelity Chemical Corp. 470 Frelinghuysen Avenue Newark, NJ 07114		2842 Metal Cleaners and Liquid Concentrates	.005
Aurilyte Process Company 25 McWhorter Street Newark, NJ 07105		3471 Electroplating	.008
Automatic Electro Plating Corp. 185 Foundry Street Newark, NJ 07105		3471 Electroplating	.019
B-Line Trucking Inc. 67 Esther Street Newark, NJ 07105		7699 Tank Truck Washing	.007
BASF Inmont Corp. 150 Wagaraw Road Hawthorne, NJ 07506		2865 Organic Colorants	.509
Baltic Dyeing & Finishing Co. Inc. 35 Eighth Street Passaic, NJ 07055	P.O. Box 535 Passaic, NJ 07055	2269 Dyer and Finishing, Service Industry	.077
Barnert Memorial Hospital Assn. 680 Broadway Paterson, NJ 07514		8062 Hospital	.071
Batteries For Industry 247 Fulton Place Paterson, NJ 07501		3691 Industrial Batteried & Chargers	.001
Beacon Sweets Inc. 107 Main Street Newark, NJ 07105		2065 Manufacture Hard Candy	.042

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Beamar Electronics, Inc. 114 Kearney Street Paterson, New Jersey 07522		3471 Mfg. Printing Circuit boards	.001
Beecham Products Div. of Beecham, Inc. 65 Industrial South Clifton, NJ 07012		2844 Cosmetic, Over the Counter Drugs	.146
Belcrest, Inc. 55 Webro Road Clifton, NJ 07012		3471 Glass and Porcelain Etching	.001
Belzak Corp. 830 Bloomfield Avenue Clifton, NJ 07012		2865 Sodium Glucoheptonate	.040
Benjamin Moore & Co. 134 Lister Avenue Newark, NJ 07105		2581 Paints	.037
Bessemer Processing Co. 135 Haynes Avenue Newark, NJ 07114		5085 Steel Drum Reconditioning	.029
Best Plating & Polishing Co. 443 South Tenth Street Newark, NJ 07103		3471 Plating	.007
Best Provisions 144 Avon Avenue Newark, NJ 07108		2011 Frankfurters, Corned Beef, Pastrami, Roast Beef	.055
Beth Israel Hospital 70 Parker Avenue Passaic, NJ 07055		8062 Hospital	.044
Biltmore Laundry Service W.G. Linen Supply 95 East 20th Street Paterson, NJ 07513	P.O. Box 155 Elmwood Pk, 07407	7219 Commercial Laundering of Textiles	.050

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Biocraft Laboratories, Inc. 92 Route 46 Elmwood Park, NJ 07407	P.O. Box 200 Elmwood Pk, NJ 07407	2834 Mfg. of penicillin and semi synthetic penicillin drug products	.008
Biocraft Laboratories, Inc. 209 McLean Blvd Paterson, NJ 07504		2834 Mfg. Pharmaceuticals	.019
Bogue Electric Manufacturing Co. 100 Pennsylvania Avenue Paterson, NJ 07509		3621 Motors and Generators	.006
Bon-Art International Inc. 99 Evergreen Avenue Newark, NJ 0714		2542 Mfg. Store Fixtures	.001
Boris Kroll Jacquard Looms, Inc. 66 Gray Street Paterson, NJ 07524		2269 Textiles	.076
Bright Star Industries, Inc. 600 Getty Avenue Clifton, NJ 07015		3692 Flashlights & Batteries	.078
Brightboy Abrasives, Inc. 351-365 Sixth Avenue Newark, NJ 07107	P.O. Box 7060 Newark, NJ 07107	2899 Abrasive Wheels, Rods and Sheets	.025
Brioschi, Inc. 19-01 Pollitt Drive Fairlawn, NJ 07410	P.O. Box 427 Fairlawn, NJ 07410	2834 Mfg. Pharmaceuticals	.001
C. A. Lausberg & Sons Inc. 351 Clinton Street Haledon, NJ 07508		3552 Machine Shop	.001
C. Patti Electro Plating Corp. 27 First Street Newark, NJ 07107		3471 Electroplating	.002

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Calgon Corp 200 Wagaraw Rd. Hawthorne, NJ 07507		2819 Polymers, Slimicides Chemicals and Catalyst	.530
Campbell Foundry 800 Bergen Street Harrison, NJ 07029		3325 Foundry	.015
Canrad Hanovia, Inc. 100 Chestnut Street Newark, NJ 07105		3699 Ultraviolet Lamps and Equipment	.026
Capitol City Products Co. Foot of Sanford Avenue Kearny, NJ 07032	P.O. Box 1025 Kearny, NJ 07032	2077 Detergents & Edible Fat Products	1.320
Cardolite Corp. 500 Doremus Avenue Newark, N.J. 07105		2892 Capseals Liquid & Solid Friction Resins	.128
Celanese Chemical Corp. 354-375 Doremus Avenue Newark, NJ 07105		2869 Formaldehyde	.063
Central Uniform Services, Inc. 137 Ralph Street Belleville, NJ 07109		3582 Laundry Service	.033
Certified Metals Company 175 Entin Road Clifton, NJ 07014		3911 Gold Wedding Rings	.009
Champion Dyeing & Finishing Co., Inc. 192 Putnam Street Paterson, NJ 07524	P.O. Box 397 Paterson, NJ 07524	2262 Dye Acetates, Nylons and Polycottons	.065
Champlain Industries, Inc Yeast Products Div. 25 Styertowne Road Clifton, New Jersey 07012		2099 Mfg. Yeast Products	.064

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Charles Beseler Company 219 South 18th Street East Orange, NJ 07018		3861 Audio-Visual Photographic Equipment	.021
Chase Chemical Company 280 Chestnut Street Newark, NJ 07105		2834 Vitamin Tablets and Gelatin Capsules	.091
Chelsea Laboratories, Inc. 481 Edward H. Ross Drive Elmwood Park, NJ 07407	P.O. Box 213 Elmwood Park, NJ 07407	2834 Mfg. Pharmaceuticals	.001
Chem-Fleur Inc. 200 Pulaski Street Newark, NJ 07105	189 Clifford Street Newark, NJ 07105	2818 Ergenol & Cyclohexyl Acetate	.048
Chem-Fleur Urban Renewal Corp. 928-964 Doremus Avenue Newark, NJ 07105		2869 Fragrance Chemicals	.010
Chemical Leaman Tank Lines Inc. 10 Morton Street East Rutherford, NJ 07070	P.O. Box 196 E.Rutherford, NJ 07070	4213 Tank Line Service	.007
Chemical Leaman Tank Lines Inc. 80 Doremus Avenue Newark, NJ 07105		7699 Tank Line Service	.006
Chemos Corp. 225-235 Emmet Street Newark, NJ 07114		2841 Textile & Leather Finishing Compounds	.036
ChinAm Inc. Morris Paperboard Div. 177 Third Avenue Paterson, NJ 07514		2645 Mfg. Cardboard	.061
Chrome Art Inc. 23 George Street Newark, NJ		3471 Electroplating	.010

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Circuit Manufacturing Corporation 9 St. Francis Street Newark, NJ 07105		3679 Mfg. Printed circuit boards	.014
Clara Maass Hospital One Franklin Avenue Belleville, NJ 07109		8062 Hospital	.160
Clayton/Corrham Corp. Corner Hamilton & Kingsland Ave Harrison, NJ 07029		2631 Mfg. Cardboard	.018
Clinton Milk Company 353 Morris Avenue Newark, NJ 07103		2026 Milk, Cream & Fruit Drinks	.062
Coca Cola Bottling Co.of NY 470 Nineteenth Avenue Paterson, NJ 07504	20 Horseneck Lane Greenwick,CT 06839	2086 Carbonated Soft Drinks	.114
Colloids, Inc. 394 Frelinghuysen Avenue Newark, NJ 07114		2869 Deformer Chemicals	.005
Columbia Textile Service, Inc. 28 Ryle Avenue Paterson, NJ 07509		2261 Dyed Material	1.221
Columbus Hospital 490 North 13th Street Newark, NJ 07107		8062 Hospital	.087
Comet Chemical Co. Div. of Chemos Corp. 410 Adams Street Newark, NJ 07114		2851 Lacquer,Thinners & Waterbased Leather, Finishers	.001
Commercial Products Co., Inc. 117 Ethel Avenue Hawthorne, NJ 07506		2843 Mfg. Textile Stiffeners & Softeners	.005

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Como Textile Prints, Inc. 191 East Railway Avenue Paterson, NJ 07503		2261 Printing on Natural and Synthetic Fibers	.193
Consolidated Laundries 12 Clifton Street Newark, NJ 07114		7213 Laundry	.069
Consolidated Rail Corp. Conrail 91 Bay Avenue Cor. Wheeler Pt. Road Newark, NJ 07105		7699 Engine House	.013
Continental Can Company 217 Brook Avenue Passaic, NJ 07055		3411 Metal Containers	.054
Continental Chemical Corp. 270 Clifton Blvd. Clifton, NJ 07015		2814 Detergents & Emulsifiers	.077
Cook & Dunn Paint Corp. 109 St. Francis Street Newark, NJ 07105	167 Kossuth Street Newark, NJ 07101	2851 Paints & Varnishes	.001
Coral Dyeing & Finishing Company 585 East 31st Street Paterson, NJ 07513	P.O. Box 2067 Paterson, NJ 07509	2261 Dyed Greige Goods	.204
Courtaulds C.P.D., Inc. 290 Ferry Street Newark, NJ 07105		3079 Plastic Sheet & Film	.221
Craft Textile Printing Co., Inc. 44 Beech Street Paterson, NJ 07509		2261 Printing on Textiles	.510
Crompton & Knowles, Corp. 52 Amsterdam Street Newark, NJ 07105		2865 Dyes	.193

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Cummins Metro Power Routes 1 & 22 Newark, NJ 07114		7538 Repair & Service of Diesel Engines	.008
Custom Optics 216 Midland Avenue Saddle Brook, NJ 07662		3851 Eye Glass Lenses	.007
Daytona Finishing Corp. 59 Wall Street Newark, NJ 07105		3471 Cold Rolled Steel	.009
Diamond Hard Chromium Co., Inc. 463 New Jersey Railroad Ave Newark, NJ 07105		3471 Hard Chrome Plating	.001
Dobbs International Services Route 70 - 156 Port Street Newark, NJ 07114		5812 Food - Airline Meals	.016
Double D Plating Co., Inc. 52 Garfield Avenue Paterson, NJ 07522		3471 Electroplating	.007
Drew Chemical Corporation 1106 Harrison Avenue Kearny, NJ 07029		2899 Industrial Type Water Treatment Products	.094
Driver-Harris Alloys, Inc. 308 Middlesex Street Harrison, NJ 07029		3356 Wire & Nickel Strips	.404
Durite Circuits Corp. 141 River Road Nutley, NJ 07110		3679 Printed Circuit Boards	.003
Dyetex Corp. Two Canal Street Passaic, NJ 07055		2257 Fabric Dyers	.638

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
E & W Piece Dye Works, Inc. 900 Passaic Avenue East Newark, NJ 07029		2262 Dye Casket Lining	.021
E. C. Electroplating, Inc. 125 Clark Street Garfield, NJ 07026		3471 Chrome and Copper Electroplating	.013
Eagle Affiliates, Inc. 505 Manor Avenue Harrison, NJ 07029		3079 Plastic Housewares	.026
East Orange General Hospital 300 Central Avenue East Orange, NJ 07019		8062 Hospital	.044
Eastern Vitamins 1 Carol Street Clifton, NJ 07014		2824 Vitamins Tablets	.001
Eastman Kodak Co. 16-31 State Hwy #208 Fairlawn, NJ 07410		7395 Processed Color Slides and Movies	.083
Edison Battery Products 75 Belmont Avenue Belleville, NJ 07109		3692 Primary Batteries	.096
Edmar Creations Co., Inc. 35 Mohegan Street Clifton, NJ 07013		3999 Casting, Plating, Welding & Stamping	.022
Ekco/Glaco Inc. One Industrial Plaza Paterson, NJ 07503	1949 N. Cicero Ave. Chicago IL. 60639	7699 Clean & coat baking plant	.025
Elan Chemical Company 268 Doremus Avenue Newark, NJ 07105		2899 Flavor & Fragrance Chemicals	.084

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Electron Technology 626 Schuyler Avenue Kearny, NJ 07032		3471 Electroplating	.001
Electronic Circuit Corp. 520 Victor Street Saddle Brook, NJ 07662		3679 Printed Circuit Board	.002
Electronic Processing Corp. 17 Central Avenue Hawthorne, NJ 07506		3471 Electroplating	.006
Empire Overall Dry Cleaners, Inc. 18 Stephanic Avenue Elmwood Park, NJ 07407	P.O. Box 432 Elmwood Pk, NJ 07407	7218 Laundry - Uniforms	.025
Engelhard Corporation 1 West Central Avenue East Newark, NJ 07029		3952 Specialty Chemical,Refractory Coating Formulation Metals	.083
Engelhard Ind. Div. of Engelhard Minerals and Chemical Corp 429 Delancy Street Newark, NJ 07105		3339 Precious Metals, Catalyst & Chemicals	.657
Essex Chemical Corp 330 Doremus Avenue Newark, NJ 07105		2819 Inorganic Acids and Salts	.041
Essex County Geriatrics Center 520 Belleville Avenue Belleville, NJ 07109		8062 Hospital	.120
Ever Ready Label Corp 357 Courtlandt Street Belleville, NJ 07109		2751 Aluminum nameplates, pressure sensitive labels	.014
Excel IV, Inc. 580 Brighton Road Clifton NJ 07012	c/o Missbrenner 211 Mt Pleasant Ave Clif on,NJ 07013	2753 Engraved Copper Rollers	.004

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Express Container Corp. 105 Avenue L Newark, NJ 07105		2653 Corrugated Boxes	.026
Faber-Castell Corp. 41 Dickerson Street Newark, NJ 07107		3069 Erasers, Rubberbands, India Ink	.051
Fabricolor Mfg. Corp. 24 1/2 Van Houten Street Paterson, NJ 07509		2865 Dyes	.096
Fairmount Chemical Co. 117 Blanchard Street Newark, NJ 07105		2865 Dydrazine & Diazo Chemicals for Blueprints	.099
Falstrom Company Falstrom Court Passaic, NJ 07055	P.O. Box 118 Passaic, NJ 07055	3444 Cabinets, Panels, Covers, Chassis & Frames	.021
Farmland Dairies 520 Main Street Wallington, NJ 07057		2026 Processed Milk and Milk Products	.187
Fine Organics Corporation 205 Main Street Lodi, NJ 07644-0995	P.O. Box 687 Lodi, NJ 07644-0995	2833 Industrial Cleaning Compounds	.008
Fischer Scientific Company One Reagent Lane Fairlawn, NJ 07410		2869 Chemical Processing	.180
Frederick Gumm Chemical Co., Inc. 538 Forest Street Kearny, NJ 07032	1280 Wall St. West Lyndhurst,NJ 07071	2899 Blending of Metal Finishing Chemical	.005
Fritzsche Dodge & Olcott A unit of BASF K&F Corp. 85 Third Street Clifton, NJ 07015		2099 Flavors & Spices	.449

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
G & H Metal Finishers Inc. 282 Dakota Street Paterson, NJ 07503		3471 Decorative Chrome Parts	.007
GSF Energy, Inc. 1501 Harrison Avenue Kearny, NJ 07032	Raritan Plaza I Raritan Center Edison, NJ 08837	4925 Mfg. Methane Gas	.001
Galaxie Chemicals Corp. 26 Piercy Street Paterson, NJ 07524	P.O. Box 443 River Station Paterson, NJ 07524	2865 Organic Azo Pigments	.075
Garden State Paper Co., Inc. 950 River Drive Garfield, NJ 07026		2621 Newsprint Manufacture	8.015
General Color Company 24 Avenue B Newark, NJ 07114		2816 Insoluble Organic Pigments	.045
General Metal & Black Finishers 3 Alva Street Bloomfield, NJ 07003		3471 Electroplating	.004
Givaudan Corp. 125 Delawanna Avenue Clifton, NJ 07014		2833 Organic Chemicals	1.240
Globe Product Co., Inc. 750 Bloomfield Avenue Clifton, NJ 07015		2033 Jellies, Jams & Pie Filling	.139
Gloube Manufacturing Company 300 First Street Harrison, NJ 07029	P.O. Box 292 Harrison, NJ 07029	3498 Wire Rings	.004
Gotham Graphics 120 Park Avenue Lyndhurst, NJ 07071	P.O. Box 157 Lyndhurst, NJ 07071	2793 Engraving & Lithographic Plates	.006

INDUSTRIAL INVENTORY

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Graphtex, Inc. 1 Dell Glen Avenue Lodi, NJ 07644	P.O. Box 816 Lodi, NJ 07644	3471 Electroplater	.002
Graver Co. - Graver Chem. Div. 72 Lockwood Street Newark, NJ 07105	2720 US Highway 22 Union, NJ 07083	2899 Powered Ion Exchange Resins & Precoats	.089
Great American Veal, Inc. 50 Avenue L Newark, NJ 07105		2011 Meat Processors	.024
H. Kohnstamm & Co., Inc Bergen & Harrison Ave Kearny, NJ 07032	P.O. Box 13 Harrison, NJ 07029	2087 Flavors	.017
H. K. Metal Craft Mfg. Corp. 35 Industrial Road Lodi, NJ 07644		3429 Gaskets & Washers	.005
H. Reisman Corporation 377 Crane Street Orange, NJ 07050		2834 Pharmaceuticals	.013
H & S Chemical Co., Inc. 54-74 Van Dyke Street Wallington, NJ 07057	P.O. Box 3107 Wallington, NJ 07507	2865 Pigment intermediates, iron hydrate pigments & dispersion stearates	.025
Hackensack Meadowlands Development Commission Harrison Ave-Landfill Site 1A Kearny, NJ 07032	1 Dekorte Park Plaza Lyndhurst, NJ 07071	4953 Leachate Discharge	.004
Harrison Baking Company 840 Jersey Street Harrison, NJ 07029		2051 Bread & Bread Products	.072
Hartz Mountain Corporation 192 Bloomfield Avenue Bloomfield, NJ 07003		2047 Pet Foods, carpet & clothing products	.013

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Henkel Corp., Process Chemicals First & Essex Streets Harrison, NJ 07029		2833 Mfg. Specialty Chemicals	.173
Heubach, Inc. 256 Vanderpool Street Newark, NJ 07114		2815 Aqueous manufacture of color pigments	.735
Highland Electro Plating & Polishing 63 Dayton Street Paterson, NJ 07509		3471 Plating and Polishing	.003
Hilton Davis Company 120 Lister Avenue Newark, NJ 07105		2815 Mfg. Pigments & Colors	.289
Hoboken Paints Inc. 40 Industrial Road Lodi, NJ 07644	P.O. Box 420 Lodi, NJ 07644-0420	2851 Latex Paint	.011
Hoffmann La Roche 340 Kingsland Road Nutley, NJ 07110		2834 Pharmaceuticals & Bulk Vitamins	4.304
Honig Chemical & Processing Co. 414 Wilson Avenue Newark, NJ 07105		2818 Sodium Acetate	.136
Hospital Center of Orange 188 South Essex Avenue Orange, NJ 07051		8062 Hospital	.082
Humko Chemical Div. Witco Chem. 652 Doremus Avenue Newark, NJ	P.O. Box 818 Newark, NJ 07105	2899 Fatty Acids & Derivatives	.534
Hummel Lanolin Corp. 185 Foundry Street Newark, NJ 07105		2299 Lanolin	.012

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Hy-Grade Electroplating 35 Fourth Street Newark, NJ 07107		3471 Electroplating	.001
ITT Avionics Division 100 Kingsland Road Clifton, NJ 07014		3661 Electronic Communication System	.238
ITT Avoinics Division 390-500 Washington Avenue Nutley, NJ 07110		3670 Electronic Communications System R&D	.048
ITT Defense Communications Div., Inc. 492 River Road Nutley, NJ 07110		3670 Electronic Communications System R&D System R&D	.039
Ideal Plating & Polishing 681 Main Street Belleville, NJ 07109	P.O. Box 100 Belleville, NJ 07109	3471 Electroplating	.027
Imperial Electro Plating Div. F.E.R. Plating 52 Park Avenue Lyndhurst, NJ 07071		3471 Electroplating	.011
Independence Plating Corp. 107 Alabama Avenue Paterson, NJ 07509		3471 Electroplating	.065
Indol Color Div-Magruder 1029 Newark Avenue Newark, NJ 07114	1029 Newark Ave. Elizabeth, NJ 07201	2865 Plastic-Dry Pigments & Resin PulverizedDrums	.092
Industrial Hard Chromium Co., Inc. 7 Rome Street Newark, NJ 07101		3471 Electroplating	.004
International Veiling Corp. 244 Hazel Street Clifton, NJ 07012	P.O. Box 108 Clifton, NJ 07011	2213 Dyeing and Finishing of Laces & Nets	.080

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Interstate Dyeing & Finishing Co. 35 Eighth Street Passaic, NJ 07055	P.O. Box 177 Passaic, NJ 07055	2261 Textile Piece Goods	.048
J.B. Hirsch Company Div. of K & K Design Studio, Inc. 111 Rome Street Newark, NJ 07105		3645 Mfg. Lamps	.003
J. L. Prescott Company 37 Eighth Street Passaic, NJ 07055		2841 Cleaning Products, Laundry & Dishwashing	.075
John L. Armitage & Co. 245 Thomas Street Newark, NJ 07114	65 Springfield Ave. Springfield NJ 07081	7391 Research & Development Lab	.001
Kalama Chemicals, Inc. 290 River Drive Garfield, NJ 07026		2865 Organic Chemicals	.450
Kaysam Corp. of America 27 Kentucky Avenue Paterson, NJ 07503		2499 Footwear	.016
Kennedy Memorial Hospitals at Saddle Brook 300 Market Street Saddle Brook, NJ 07662		8062 Hospital	.104
Keystone Automotive Industries, Inc. 24 Legal Street Newark, NJ 07114		3471 Electroplating of Automobile Bumpers	.007
Kikuchi Color & Chemical Corp. 19 East Fifth Street Paterson, NJ 07524		2816 Chrome Yellow Pigments	.044
Kingsland Drum & Barrel 308 Miller Street Newark, NJ 07114		5085 Recondition Steel Drums	.049

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Kleer Kast Div. of PMC, Inc 450 Schuyler Ave. Kearny, NJ 07032		3079 Fabricate tool handles, fabricate cellulose acetate rod	.006
Kohinoor Electro Plating Corp. 11 Paterson Avenue Wallington, NJ 07057		3471 Electroplating	.009
Kohl & Madden, Inc. 130 Gregg Street Lodi, NJ 07644		2893 Ink Printing	.021
Kohler Delicatessan Meats Inc. 57 Napolean Street Newark, NJ 07524		2013 Provisions - Cold Cuts	.033
Kramer Chemicals Inc. 109 Fifth Avneue Paterson		5161 Blending of Caustic & Chemcial Distribution	.023
Krementz & Co. 375 McCarter Hwy. Newark, NJ 07105		3911 Mfg.-Gold Rings	.001
Launder Leasing Services Div. Man. Laund. 58 Gould Avenue Newark, NJ 07107		7219 Laundry - Linens	.075
Lea & Perrins, Inc. 15-01 Pollitt Drive Fairlawn, NJ 07410		2035 Meat Sauces	.005
Leader Dyeing & Finishing Co. 94 Madison Avenue Paterson, NJ 07509	P.O. Box 2093 Paterson, NJ 07509	2261 Textile Processing	.315
Liberty Optical Mfg., Inc. 380 Verona Avenue Newark, NJ 07104		3851 Optical Frames	.004

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Liberty Provisions, Inc. 200 Piaget Avenue Clifton, NJ 07011		2013 Provisions - Cold Cuts	.061
Linden Packing Company, Inc. 324 Astor Street Newark, NJ 07114		2011 Meat Products	.138
Liquid Cargo, Inc. 470 Schuyler Avenue Kearny, NJ 07032		7699 Wash Tanks & Trucks	.001
Little Falls Alloys 171-191 Caldwell Avenue Paterson, NJ 07509		3356 Metal Rolling	.007
Loisel Manufacturing Corp. 168 Eighth Avenue Paterson, NJ 07514		3471 Lamp Components and Accessories	.005
Lummus Crest Inc. 1515 Broad Street Bloomfield, NJ 07003		8911 Engineering pilot plant work	.087
Magruder Color Company One Virginia Street Newark, NJ 07114		2865 Organic Pigments	.440
Manco Plating, Inc. 390 Park Avenue Newark, NJ 07107		3471 Electroplating	.003
Mann Kraft Corp. 1000 U.S. Highway #1 Newark, NJ 07114		2649 Corrugated Cartons	.017
Manner Textile Processing Corporation 293 Morrissee Avenue Haledon, NJ 07508		2261 Textile Piece Goods	.122

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Mara Polishing & Plating Co. 105-107 Peddie Street Newark, NJ 07108		3471 Electroplating	.003
Marcal Paper Mills, Inc. One Market Street Elmwood Park, NJ 07407		2611 Household Paper Products	3.004
Material Processing Technology, Inc. 95-111 Prince Street Paterson, NJ 07501		2834 Mfg. Pharmaceuticals	.004
McKesson Enviorsystems Co. 600 Doremus Avenue Newark, NJ 07105		7399 Solvent Recovery	.059
Medin Metal Technology 125 South Street Passaic, NJ 07055	111 Lester Street Wallington, NJ 07052	3471 Anodized Aluminum Parts	.004
Metal Parts Processing Co., Inc. 165 Delancy Street Newark, NJ 07105		3559 Deburring Service	.003
Miles Labs, Inc. 193 Arlington Avenue Clifton, NJ 07015		2818 Enzymes	.456
Miller & Sons Inc. 24 Belleville Avenue Belleville, NJ 07109		3471 Anodizing, Electroplating, Metal Finishing	.025
Minwax Company, Inc. 16 Cherry Street Clifton, NJ 07014	102 Chestnut Ridge Montvale, NJ 07645	2842 Concrete Patch, Patching Plasters	.001
Missbrenner Prints Inc. 211 Mt. Prospect Avenue Clifton, NJ 07013	P.O. Box 1587 Clifton, NJ 07013	2261 Textile Printing	.588

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Mobay Chemical Corp. 550 Belmont Avenue Haledon, NJ 07508	P.O. Box 419 Hawthorne, NJ 07507	2815 Pigment Mfg.	1.306
Mona Industires, Inc. 76 East 24th Street Paterson, NJ 07524		2843 Surfactants and Specialty Chemicals	.224
Montclair Community Hospital 120 Harrison Avenue Montclair, NJ 07042		8062 Hospital	.015
Morton Thiokol, Inc. Morton Chemical Division 335 McLean Blvd. Paterson, NJ 07504		2899 Dyestuffs	.239
Mother's Food Products W/O Subsidiary of H.H.R. Food Industries Inc. 80 Avenue K Newark, NJ 07105		2032 Borscht, Gefilte Fish	.008
Mountainside Hospital Bay & Highland Avenues Glen Ridge, NJ 07042		8062 Hospital	.116
Moyer Plating Corp. 175 Christie Street Newark, NJ 07101		3471 Electroplating	.007
NJ Transit-Penn Station Raymond Plaza West Newark, NJ 07102		4013 Railroad Station	.083
NSC Plating & Polishing Co., Inc. 242 South 12th Street Newark, NJ 07109		3471 Polishing & Plating	.011
Nabisco, Inc. 2111 State Hwy #208 & McBride Ave Fairlawn, NJ 07410	Corp Engineering Dept. 500 Laidex Plaza Parsippany, NJ 07054	2052 Cookies and Crackers	.110

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Napp Chemicals, Inc. 199 Main Street Lodi, NJ 07644	P.O. Box 4900 Lodi, NJ 07644	2833 Pharmaceuticals & Fine Chemicals	.057
National Standard Company 716 Clifton Avenue Clifton, NJ 07015		3316 High Carbon Strip & Wire	.135
New Jersey Galvanizing & Tinning Works 139 Haynes Avenue Newark, NJ 07114		3479 Steel Galvanizing	.015
New Jersey Tanning Co., Inc. 410 Frelinghuysen Avenue Newark, NJ 07114		3111 Tanning of Cattlehides	.026
Newark Beth Israel Medical Center 201 Lyons Avenue Newark, NJ 07112		8062 Hospital	.141
Newark Boxboard Company 17 Blanchard Street Newark, NJ 07105		2631 Paperboard	.170
Newark Morning Ledger Co. Star Ledger Plaza Newark, NJ 07101		2711 Newspaper	.084
North Jersey Skein Dyeing Co., Inc. 152 Putnam Street Paterson, NJ 07524		2269 Dyed Yarns	.028
Northern Feather, Inc. 31-39 Backus Street Newark, NJ 07105	26-30 Papetti Plaza Elizabeth, NJ 07206	2392 Pillows & Comforters	.009
Nu-Tronic Circuit Co., Inc. 250 East 17th Street Paterson, NJ 07524		3679 Printed Circuit Boards	.015

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
O.M.I. International Corp. 75 River Road Nutley, NJ 07110		2889 Metal Plating Salts, Reclaim Precious Metals	.039
Ocean Leather Corporation 42 Garden Street Newark, NJ 07105		3111 Tanning & Finishing of Leather	.296
Okonite Company 959 Market Street Paterson, NJ 07509		3351 Insulated Wire and Cables	.141
Ondecker Metal Finishing, Inc. 178-182 Emmet Street Newark, NJ 07105		3471 Electroplating	.003
Orbis Products Corporation 55 Virginia Avenue Newark, NJ 07114		2865 Organic Chemicals	.014
Orient Chemical Corp. 121 Tyler Street Newark, NJ 07114		2269 Dyestuffs	.007
Orval Kent Food Company, Inc. 164 Madison St. East Rutherford, NJ 07073		2098 Salad & Dressings	.282
P & K Pole Products 84 Foundry Street Newark, NJ 07105		2499 Aluminum Poles	.010
P.N.C., Inc. 115 East Centre Street Nutley, NJ 07110		3679 Printed Circuits	.026
Pan-Graphics, Inc. 45 Hartmann Avenue Garfield, NJ 07026		2753 Photo Engraving	.012

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Pantasote Co., of N.Y. 26 Jefferson Street Passaic, NJ 07055		2821 P.V.C. Flexible Film & P.V.C. Trays	.011
Paragon Dyeing & Finishing Co., Inc. 69-77 Chadwick Street Paterson, NJ 07509	P.O. Box 2136 Paterson, NJ 07509	2262 Textile Fabrics	.031
Passaic Colors & Chemicals Company 28-36 Paterson Street Paterson, NJ 07501		2861 Dyestuffs	.026
Paterson Bleachery & Chemicals 207 East 15th Street Paterson, NJ 07524		2299 Bleach and Dye Raw Stock	.034
Paterson Canning Company 35 Getty Avenue Paterson, NJ 07503		2086 Canned Soda	.011
Paul's Dyeing Company One Main Street East Orange, NJ 07018	626 Orange St. Newark, NJ 07107	2258 Dyed Goods	.024
Peerless Tube Co., Inc. 58-76 Locust Avenue Bloomfield, NJ 07003		3496 Mfg. Metal Tubes & Cans	.094
Penco of Lyndhurst, Inc. 530-540 New York Avenue Lyndhurst, NJ 07071		2833 Analgesic compounds, botanical food extracts	.126
Penick Corp. 158 Mt. Olivet Street Newark, NJ 07114		2833 Pharmaceuticals and Stearates	.288
Perennial Printing Corporation Three East 26th Street Paterson, NJ 07509	P.O. Box 2285 Paterson, NJ 07509	2261 Textile Printing	.159

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Phillips Mfg. Company 190 Emmet Street Newark, NJ 07101		3461 Buttons and Badges	.003
Plating City Corp. 347 Ferry Street Newark, NJ 07105		3471 Electroplating	.003
Polaris Plating Inc. 200 Keen Street Paterson, NJ 07524		3471 Plating of Hardware	.009
Polarome Manufacturing Co., Inc. 361 South Street Newark, NJ 07105	22 Ericsson Place New York, NY 10013	2087 Flavor and Fragrance Chemicals	.029
Polychrome Chemicals Corp Cellomer Division 46 Albert Avenue Newark, NJ 07105		2821 Alkyd Resins & Photo Sensitive Chemicals	.029
Pope Chemical Corporation 33 Sixth Avenue Paterson, NJ 07524-0304		2893 Pigments, Vehicles and Pigments Dispersions	.375
Poughkeepsie Finishing Corporation 48 East 5th St. Paterson, NJ 07524	P.O. Box 2158 Paterson, NJ 07509	2263 Textile Fabrics from Greige State	.145
Power Conversion, Inc. 495 Boulevard Elmwood Park, NJ 07407		3692 Mfg. Lithium Batteries	.014
PowerTech, Inc. 0-02 Fairlawn Avenue Fairlawn, NJ 07410		3674 Power Transistors	.006
Precision Products Company Two Llewellyn Avenue Hawthorne, NJ 07506		3728 Printed Circuit Boards, Copper Clad Laminates	.010

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Precision Prototypes Inc. 255 Midland Avenue Garfield, NJ 07026		3471 Printed Circuit Boards	.007
Presto Lock, Inc. 100 Outwater Lane Garfield, NJ 07026		3429 Luggage Hardware	.086
Public Service Electric & Gas Company South 4th St & Passaic River Harrison, NJ 07029		4925 Manufacture Utility Gas	.043
Quality Metal Finishing Corp. 80 George Street Paterson, NJ 07503		3471 Plating	.004
R.H.E., Inc. 53 Rome Street Newark, NJ 07105		2371 Fur Felt Headwear	.003
Rainbow Dye & Finishing Inc. 20-21 Wagaraw Road Fairlawn, NJ 07410		2261 Dye and Finish Piece Goods	.063
Ranno Electro Plating, Corp. 280 Midland Avenue Saddle Brook, NJ 07662		3471 Plating of Metal	.056
Renco Finishing Corp. 20-21 Wagaraw Road Fairlawn, NJ 07410		2261 Fabric Dyeing	.073
Rennie Mfg. & Finishing Corp. 12 Rennie Place Lodi, NJ 07644		3471 Electroplating	.005
Rent All Processors 265 Cortlandt Street Belleville, NJ 07109	P.O. Box 38 Belleville, NJ 07109	7213 Laundry Service	.114

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Reyom Corp. 173 Christie Street Newark, NJ 07105		3471 Electroplating	.003
Riverside Coat & Linen Supply Co. 179 Lafayette Street Paterson, NJ 07501		7211 Laundry - Linens	.081
Roche Diagnostics One Franklin Avenue Belleville, NJ 07109		2831 Diagnostic Kits	.048
Roman Adhesives, Inc. 5 Lawrence Street Bloomfield, NJ 07003		2891 Ready Mix Wallpaper Adhesives	.015
Ronson Metals Corp. 45-65 Manufacturers Place Newark, NJ		3356 Rare Earth Metals and Alloy Products	.015
S. Neumann Leather Corp. 46 Johnson Street Newark, NJ 07105		3111 Tanning & Finishing of Leather	.015
S.M.S. Modern Creative, Inc. 35 Market Street Elmwood Park, NJ 07407		3231 Decorate Containers	.012
SCA Chemical Services Div. Chemical Waste Management 100 Lister Avenue Newark, NJ 07105		4953 Commercial Waste Treatment Facility	.049
SICPA New Jersey, Inc. 2 Bridewell Place Clifton, NJ 07014-1029	P.O. Box 1029 Clifton, NJ 07014	2893 Printing Inks	.012
Sandoz Chemical Corp. Fairlawn Ave & Third St. Fairlawn, NJ 07410		2815 Specialty Chemicals	.044

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Sandvik, Inc. 1702 Nevins Road Fairlawn, NJ 07410		3545 Cutting Tools & Holders	.021
Scher Chemicals Inc. Industrial W.&Styertowne Rd Clifton, NJ 07012	P.O. Box 1236 Clifton, NJ 07012	2869 Detergents, Industrial Chemical Specialties	.026
Schering Corp. Div. of Schering-Plough Corp. 60 Orange Street Bloomfield, NJ 07003		2834 Pharmaceuticals	.277
Schiffenhaus Packaging Corp. 2013 McCarter Highway Newark, NJ 07104		2754 Corrugated Containers and Displays	.024
Sealtronics, Inc. 320 Colfax Avenue Clifton, NJ 07013		3662 Hermetic Seals	.042
Seton Leather Company 349 Oraton Street Newark, NJ 07104	849 Broadway Newark, NJ 07104	3111 Leather Tanner	1.039
Shamrock Chemical Corp. Foot of Pacific Street Newark, NJ 07114		2399 Additions for Lubricating Powders	.004
Shofar Kosher Foods, Inc. 219 Emmet St. Newark, NJ 07114	P.O. Box 2159 Newark, NJ 07114	2013 Kosher Provison Mfg.	.019
Shulton, Inc. 697 Rt. #46 Clifton, NJ 07015	P.O. Box 1809 Clifton, NJ 07015	2844 After Shave Lotion, Stick Deodorant	.072
Signature Cloth Company, Inc. 200 Clifton Blvd Clifton, NJ 07015	P.O. Box 1445 Clifton, NJ 07015	2262 Textile Finishing	.114

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Sky Chefs Brewster Road - Bldg. #95 Newark, NJ 07114		5812 Food - Airline Meals	.013
Spectrachem Corp. 200 Sheridan Avenue Paterson, NJ 07502	P.O. Box 308 Paterson, NJ 07511	2843 Textile Prinitng Inks	.065
Spencer Kellogg Products NL Chemicals/NL Industries, Inc. 400 Doremus Avenue Newark, New Jersey 07105		2820 Alkyd-Poyester Rosins	.077
St. James Hospital 155 Jefferson Street Newark, NJ 07105		8062 Hospital	.044
St. Joseph's Hospital & Medical Center 703 Main Street Paterson, NJ 07503		8062 Hospital	.180
St. Mary's Hospital 125 South Center Street Orange, NJ 07050		8062 Hospital	
St. Mary's Hospital 211 Pennington Street Passaic, NJ 07055		8062 Hospital	.066
St. Michaels Hospital & Medical Center 208 Dr. Martin Luther King Blvd. Newark, NJ 07102		8062 Hospital	.045
Stacy Industries, Inc. 38 Passaic Street Wood-Ridge, NJ 07075	P.O. Box 395 Wood-Ridge, NJ 07075	2295 Non Woven - Coated Fabrics	.047
Standard Tallow Corp. 1215 Harrison Avenue Kearny, NJ 07032		2077 Tallow, Meat & Bone Meal	.061

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Stirrup Metal Products Corp. 215 Emmet Street Newark, NJ 07101		3479 Air Valves	.001
Suffern Plating Corp. 210 Garibaldi Avenue Lodi, NJ 07644		3471 Electroplating	.044
Sun Chemical Corporation 185 Foundry Street Newark, NJ 07105		2865 Organic Pigments	.043
Sun Metal Finishing Inc. 54 Bleeker Street Paterson, NJ 07524		3471 Zinc Plating	.029
Sun Plastics Co., Inc. 900 Passaic Avenue East Newark, NJ 07029		3652 Phonograph Records	.024
Sunbrite Dye Co., Inc. 35 Eighth Street Passaic, NJ 07055	P.O. Box 1076 Passaic, NJ 07055	2269 Processed Synthetic Piece Goods	.092
Superior Dyed Furs, LTD 100 Dayton Avenue Passaic, NJ 07055		2371 Fur Dyeing	.013
Supreme Heat Treating Inc. 8-12 Clifton Avenue Newark, New Jersey 07103		3471 Harding, Tempering Black Oxidizing of Steel	.014
Supreme Santell Linen Supply, Inc. 124 Delancy Street Newark, NJ 07105		7213 Laundry - Linen	.037
Swepco Tube Corp. One Clifton Blvd. Clifton, NJ 07015		3356 Stainless Steel Pipe, fittings & tubing	.052

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
T & E Industries, Inc. 215 Watching Avenue Orange, New Jersey 07050		3674 Electronic terminals & connectors	.017
T. A. Farrell Plating Company 39 Atlantic Street Garfield, NJ 07026		3471 Electroplating	.007
TRB Electro Corporation 6 Morris Street Paterson, NJ 07501	P.O. Box 840 Park Station Paterson NJ 07501	3471 Electroplating	.001
Technical Plastic Extruders Div. of PMC 574 Ferry Street Newark, NJ 07105		3079 PVC Plastic - Sheets and Rolls	.053
Textile Piece Dye Co., Inc. 451 Fifth Avenue Paterson, NJ 07509	P.O. Box 2246 Paterson, NJ 07509	2261 Dyer of Textiles	.211
The Dial Corp. Two Wood Street Paterson, NJ 07524		2841 Detergents & Bleaches	.125
The General Hospital at Passaic 350 Boulevard Passaic, NJ 07055		8062 Hospital	.117
The Narrotex Corp. 245 Fourth Street Passaic, NJ 07055		2269 Narrow Fabric Textile Dyers	.010
The Okonite Company, Inc. Jefferson & Canal Streets Passaic, NJ 07055		3357 Insulated Wire & Cable	.021
The Sherwin-Williams Co. Brown Street & Lister Ave Newark, NJ 07105	P.O. Box 717 Newark, NJ 07105	2851 Consumer & Industrial Coatings & Thinners	.043

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Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
The Van Iderstine Company Div. of Darling Delaware Co., Inc. 825 Wilson Avenue Newark, NJ 07105		2077 Tallow & Meat Meal	.109
Thomas Henshall Silk Finishing 50 West Peel Street Paterson, NJ 07524		2261 Textile Finishing	.002
Thorn Inc. T/A Continental Piece Dyeing & Finishing Co., Inc. 15-19 First Avenue Paterson, NJ 07524		2299 Textile Piece Goods	.104
Timco Inc. 666 South 16th Street Newark, NJ 07103		3479 Plating	.003
Trio Dyeing & Finishing Co., Inc. 440-450 East 22nd Street Paterson, NJ 07509	P.O. Box 2412 Paterson, NJ 07509	2261 Dye & Finish Textile Goods	.316
Trio Plating Co., Inc. 61 Willett Street Passaic, NJ 07055		3471 Copper & Chrome Plating	.002
Troy Chemical Company One Avenue L Newark, NJ 07105		2879 Chemicals for Paint Industry	.024
Union Camp Corp. 800 State Hwy #3 Clifton, NJ 07012	P.O. Box 555C Clifton NJ 07012	2605 Custom Packaging, Folding Cartons Lables	.007
United Hospitals Medical Center 15 South Ninth Street Newark, NJ 07107		8062 Hospital	.047
Universal Mfg Corp. 29 East Sixth Street Paterson, NJ 07524	P.O. Box 3028 Paterson, NJ 07509	3351 Fluorescent Ballasts	.100

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
University of Medicine & Denistry of NJ 100 Bergen Street Newark, NJ 07103		8062 Hospital	.606
Van Dyk, Div. of Mallinckrodt, Inc. Main & Williams Streets Belleville, NJ 07109		2844 Perfume, Chemicals, Compound Specialites	.146
Van Ness Plastic Molding Co., Inc. 555 Cortlandt Street Belleville, NJ 07109		3079 Plastic Pet Supplies	.089
Vibra-Con Inc. 280 Ninth Avenue Hawthorne, NJ 07506		3471 Job Shop Plating operation	.005
Victory Optical Mfg., Co. 19 Mulberry Place Newark, NJ 07102	1 Victory Plaza Newark, NJ 07102	3851 Eyeglass Frames	.015
Videx Equipment Corp. 170 Railroad Avenue Paterson, NJ 07501		3542 Rebuilt Extrusion Machinery	.001
Wallace & Tiernan Div. of Pennwalt Corp. 25 Main Street Belleville, NJ 07109		3829 Measurement, Control Equipment	.108
Warner Manufacturing Corp. 100 Third Avenue Kearny, NJ 07032		3354 Aluminum Extrusions	.001
West Hudson Memorial Hospital 206 Bergen Avenue Kearny, NJ 07032		8062 Hospital	.022
Weston USA Div. Solartron Transducers 614 Frelinghuysen Avenue Newark, NJ 07114		3611 Thermometers, Aerospace Indicators	.010

INDUSTRIAL INVENTORY

POTW: Passaic Valley Sewerage Commissioners

NJPDES NO.: 0021016

Facility Name Location Address	Mailing Address if Different	SIC Codes Brief Description	Average Daily Flow (mgd)
Westwood Lighting Group, Inc. 177 Genesse Avenue Paterson, NJ 07503		3645 Lamps	.055
White Chemical Company 646 Frelinghuysen Avenue Newark, NJ 07114		2833 Acid Chlorides, Brominated Flame Retardants	.097
Witco Corporation Organic Div. 160 East Fifth Street Paterson, NJ 07524		2841 Detergents and Allied Chemicals	.069
Worthington Pump Div. Dresser Ind., Inc. 401 Worthington Avenue Harrison, NJ 07029		3561 Pumps & Machinery	.182
Zenith Dyeing & Finishing Corp. 53 East 23rd Street Paterson, NJ 07509	P.O. Box 2392 Paterson, NJ 07509	2261 Textile Dyeing & Finishing	.149