SUPPLEMENTAL REMEDIAL WORK PLAN

Prepared for:

BLACK & DECKER (U.S.) INC.
Hampstead, Maryland

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INTRODUCTION

1.1 OVERVIEW

The Black & Decker (U.S.) Inc. facility, located at 626 Hanover Pike, Hampstead, MD, has been the subject of a groundwater and soil investigation and remediation program for a number of years, under the supervision of the Maryland Department of the Environment (MDE). Previous activities at the site relative to the environmental investigation and subsequent remediation are described in Section 2 of this document.

This Supplemental Remedial Work Plan has been prepared in direct response to the requirements of an Administrative Consent Order between the State of Maryland Department of the Environment (MDE) and Black & Decker (U.S.) Inc. (Consent Order) finalized during April, 1995. Specifically, Condition IV.U.(1) through (7) of the Consent Order calls for statement of the potential problems posed by the site, a summary of known site conditions, development of a site conceptual model, plans for specific additional investigations, a health and safety plan, sampling and analysis methodologies and QA/QC procedures, and plans for additional sampling in two lagoons located at the facility. This document is one of several which are being prepared in response to the Consent Order; each of these documents are to be submitted to the MDE in accordance with the schedule outlined in the Consent Order. Final versions of the documents are to become part of the administrative record for the site which is to be maintained at a public repository in the town of Hampstead.

1.2 OBJECTIVES

The primary objective of this work plan is to provide the information required by Condition IV.U.(1) through (7) of the Consent Order. Each of the elements of that condition have been addressed in the plan. Additionally, details regarding health and

safety planning and sampling and analysis methodologies and QA/QC procedures are provided in a companion document, the Sampling and Analysis Plan (SAP). The SAP is developed as a separate document because procedures described in that plan also apply to other activities and plans for the site (quarterly groundwater monitoring, etc.). In this manner, the SAP can serve as a single reference containing details related to field sampling and laboratory methodologies and QA/QC procedures. Hence, an objective of this Supplemental Remedial Work Plan is not to provide detailed information regarding methodologies; rather, the plan provides background technical and site characterization information and conceptual descriptions of the work to be performed.

SECTION 2
PREVIOUS SITE INVESTIGATIONS

2.1 INITIAL GROUNDWATER INVESTIGATION (G&M)

In April 1984, as part of an effort to determine the impact of a gasoline spill at the Hampstead Exxon service station, water samples of the supply wells at the Hampstead Black & Decker (U.S.) Inc. facility were collected and analyzed by the State of Maryland for volatile organic compounds (VOCs). As a result of the detection of VOCs, Geraghty & Miller, Inc. (G&M) was contracted to conduct a groundwater assessment of the site.

The field investigation was conducted to evaluate potential contaminant source areas in the northwestern corner of the property and included surface geophysics (EM and MAG), installation and analytical sampling of 21 monitor wells, packer testing of production wells 6 and 7, and a pumping test of production well 7.

In general, based on the initial groundwater investigation, G&M concluded that several source areas within the "drill site" area contributed to the groundwater contamination. G&M also concluded that the major pathway of contamination to Well 7 was from a single zone at the interface between weathered bedrock and competent bedrock and that all zones of groundwater flow seemed to be hydraulically connected. In addition, G&M suggested that aquifer remediation and contaminant migration control could potentially be achieved by a "pump and treat" technology.

2.2 PHASE I ACTIVITIES

In 1987, the Black & Decker Corporation retained Roy F. Weston, Inc. (Weston) to conduct a comprehensive environmental investigation of the facility. Phase I of Weston's environmental investigation, conducted in November and December 1987, utilized soil gas sampling, soil borings, geophysical surveying, test pit excavations, surface water (lagoon)

and sediment sampling, and groundwater sampling in an effort to identify potential sources of the constituents found in the groundwater. Data collected during the Phase I investigation were evaluated and the resultant conclusions were incorporated in the design of the Phase II investigation. The following subsections summarize the field activities that were conducted as a part of Weston's Phase I investigation. Sampling procedures, sample locations and analytical results are described in detail in the Environmental Investigation Report (EIR) (Weston, April 1989). During all field activities, QA/QC procedures were followed as detailed in the September 1987 work plan (Weston, 1987).

2.2.1 Soil Gas Sampling

Soil gas analysis was one of the investigative techniques used to evaluate the storage tank area and the site near the corner of buildings 5 and 6. In the storage tank area, 19 soil-gas samples were collected and analyzed for TCE and PCE from Tank Farm 1 (eight samples), Tank Farm 2 (three samples), and the aboveground storage tank area (eight samples). Sample locations were concentrated around distribution pipes and the underground and aboveground tanks identified on the site plans.

An extensive soil gas survey was conducted near buildings 5 and 6 (northwest part of the main plant building) to assess the potential for heat treat residues and constituents found in the groundwater. Forty-four soil gas samples were collected and analyzed for TCE and PCE. As can be seen on Figure 3-15 in the EIR, the soil gas sampling grid extended from the west and northwest side of the main plant building west to then production well 7 (now extraction well EW-10). In general, both TCE and PCE were detected at low levels in the soil gas samples, which did not indicate a source area. The results were used to identify soil boring and proposed monitor well (Phase II) locations.

2.2.2 Soil Borings

Soil borings were conducted to evaluate further the storage tank area and the site near the corner of building 5 and 6. In the storage tank area, soil borings were performed at five locations based on the soil gas results. Samples were collected from the borings and submitted for TPH and VOC analysis. Sample results indicated that further characterization of the soils in Tank Farms 1 and 2 in Phase II was warranted.

At the site near buildings 5 and 6, seven soil borings were performed throughout the area and samples were collected for VOC and cyanide analyses. In general, the analytical results indicated that this area did not contain waste materials and did not contain significant levels of groundwater contaminants.

2.2.3 Geophysics

Weston conducted geophysical surveys, utilizing magnetics (MAG) and electromagnetics (EM) methods, to define the boundaries of buried tools in the suspected product disposal area and the suspected past burn area. The geophysical survey data was interpreted to determine suspected fill areas for further characterization by test pit excavations.

2.2.4 Test Pit Excavations

Test pits were excavated in the suspected heat treating residues area and, based on geophysical surveys, were also excavated in the fill site near the seep area, the suspected product disposal area, and the suspected burn area.

At the suspected heat treating residues area, four test pits were excavated in two areas where material may have been deposited from heat-treating furnaces that previously operated at the facility. Soil samples were collected and were analyzed for VOCs, based on the constituents present in the groundwater, and EP toxicity metals and cyanide, based

on constituents typically associated with heat treatment. The analytical results indicated that the fill area was not a current source of groundwater contamination and that no further source characterization was warranted in this area.

At the fill site near the seep area (referred to as Zone B in the EIR), eight test pits were excavated in previously identified fill areas to characterize visually the material and to sample for VOC and EP toxicity metals. The analytical results indicated that the fill area was not a current source of groundwater contamination and that no further source characterization was warranted in this area.

After interpretation of the geophysical data, four test pits were excavated in the suspected product disposal area and soil samples were collected for VOCs and EP toxicity metals analyses. The analytical results indicated that the product burial area did not represent a source of groundwater contamination.

Based on anomalies identified in the geophysical survey, two test pits were also excavated in the suspected burn area. Samples for VOC and TPH analyses were collected from the test pit excavations. The analytical results did not confirm the reported possible use of this area for the burning of off-specification tool products, and indicated that the area did not contain waste materials. No significant contamination was detected in soil samples collected in this area.

2.2.5 Surface Water and Sediment Sampling

At the suspected heat treating residues disposal area, one stream sediment sample was collected for VOCs, EP toxicity metals, and cyanide analyses. The analytical results indicated that the stream sediment in this area did not represent a source of groundwater contamination.

At the lagoon areas, four sediment and two surface water samples were collected from the East Lagoon and four sediment and one surface water samples were collected from the West Lagoon. Both the sediment and surface water samples were analyzed for VOCs, EP toxicity metals, priority pollutant metals, and nitrates. The results of these analyses indicated that low to moderate concentrations of contaminants were present at several sampling locations in the lagoons and that a Phase II monitor well should be located in the lagoon area.

2.2.6 Groundwater Sampling

At the fill site near the seep area, groundwater samples were collected from six existing monitor wells and analyzed for VOCs in order to determine the effect pumping of well 7 had on PCE and TCE concentrations in the local groundwater. These analytical results were consistent with previous results, primarily showing concentrations of PCE in excess of 100 ppb.

2.3 PHASE II ACTIVITIES

Phase II of Weston's environmental investigation, conducted in June, July, and December 1988, involved supplemental monitor well installation, additional soil borings, and groundwater and soil sampling and analysis. These activities aided in further definition of the extent of contamination of the on-site soil and groundwater, characterized routes of migration, and provided preliminary data to be considered in developing remedial alternatives. The following subsections describe the field activities that were conducted as a part of the Phase II investigation.

2.3.1 Monitor Well Installation and Groundwater Sampling

During the Phase II investigation, 17 monitor wells were installed across the site. Groundwater samples were collected from the 17 newly installed monitor wells, 7 monitor

wells previously installed by G&M, and 3 production wells (wells 5, 6, and 7). The samples were submitted for VOC analysis. The groundwater sample results confirmed that the major contaminants of concern in the groundwater were TCE and PCE and a remediation plan was recommended to recover contaminated groundwater and prevent its migration off-site.

2.3.2 Water Level Measurements

Following installation, monitor well elevations were surveyed to establish reference points for water level measurements. During Phase II, several sets of water level measurements were collected in order to determine groundwater flow directions at the site.

2.3.3 Soil Borings

In the tank farm area, a total of 13 soil borings were performed at Tank Farm 1 and a total of 14 soil boring were performed at Tank Farm 2. Soil samples were collected from borings at both areas and analyzed for VOCs and TPH. TCLP analysis was also conducted on selected samples to provide an indication of the mobility of the contaminants in the soil. An overall assessment of Tank Farm 1 suggested that the TPH and VOCs in the soil were present below concentrations which would impact groundwater on-site. However, an overall assessment of Tank Farm 2 suggested that VOCs, particularly TCE and PCE, in the soil were present at concentrations which could potentially impact the groundwater.

2.4 REMEDIATION SYSTEM DESIGN ACTIVITIES

Based on the Phase I and II investigations, remediation strategies to recover and treat the contaminated groundwater were proposed in the 1989 EIR. A work plan for soil and groundwater remediation was developed and submitted to MDE in December of 1989. In 1991, after receiving MDE approval of the work plan, Weston initiated a remediation

system design investigation. The field investigation for the remedial design of the groundwater recovery and treatment system at the Black & Decker facility involved geophysics, well installation, aquifer testing and groundwater sampling. Each of these activities is summarized in the following subsections.

2.4.1 Geophysics

Prior to the installation of the recovery wells, surface geophysical investigations were conducted on the east and west sides of the property to locate areas which had the greatest potential of intercepting potential major water-yielding zones. Two different methods, EM and very low frequency (VLF) electromagnetics, were utilized to measure electrical conductance contrasts in the subsurface materials. These methods were selected because materials which have higher conductance properties typically indicate fracture locations.

2.4.2 Recovery Well Installation

Seven new recovery wells, capable of yielding significant quantities of water (> 20 gpm), were installed during the remediation system design investigation (ten recovery wells now exist; three of these are converted monitor or production wells). A series of pilot holes were drilled at locations which were chosen based on the results of the geophysical investigations. While fractures were intercepted at most of the pilot holes, many were filled with clay and did not produce significant water. Additional pilot holes were drilled as a result of a field reconnaissance of the site and were positioned in locations where recovery wells were suspected to be needed. Consistent with earlier findings, most yields were derived from the lower part of the saprolite and upper 10 to 20 feet of bedrock.

At each potential recovery well location, an 8-inch "pilot hole" was drilled a minimum of 25 feet into competent bedrock using the air rotary drilling method (previous drilling has indicated that no significant water-bearing zones are encountered further than 25 feet

into competent bedrock). Once the total depth was reached, the borehole was developed and the yield was estimated. If the total yield was less than 40 gpm, and the pilot hole was in a location that could be used as an observation point, a 2-inch diameter well was installed to aid in the characterization of aquifer properties during pumping tests. In areas where there was an adequate number of observation wells, boreholes were abandoned.

In cases where the total yield of the borehole exceeded 40 gpm, the 8-inch borehole was widened to a diameter of 12 inches and a well was installed to a depth of approximately five feet below the deepest observed water producing zone.

2.4.3 Aquifer Testing

A series of well performance and aquifer tests were conducted as part of the field work to collect data required for the design of the groundwater recovery system. An 8 hour step-drawdown test was conducted at each potential recovery well to evaluate well performance and to estimate the maximum sustainable well yield. Three long-term (duration of 24 hours or longer) aquifer tests were conducted to characterize aquifer properties at the site. Table 2-1 summarizes the specifications of each of the aquifer tests conducted at the site. The results of the pumping tests were used to develop an analytical flow model to determine the number and spacing of wells needed to create a hydraulic barrier.

2.4.4 Groundwater Sampling

Time series groundwater samples were collected from selected recovery wells during five of the seven pumping tests. The time series samples were collected periodically during each pumping test to characterize potential trends in VOC concentrations as pumping continued. The results of the time series sampling were used to evaluate the efficiency of the wells in recovering contaminated groundwater and as input to the design of the treatment system.

Table 2-1

Pumping Test Specifications
Black & Decker
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Pumping Well	Duration of Test (hrs)	Purpose of Test
PH-8 (EW-9)	4	Well Performance
PH-8 (EW-9)	70	Aquifer Characterization
PH-1A (EW-3)	4	Well Performance
PH-1A (EW-3)	30	Aquifer Characterization
RFW-12 (EW-1)	8	Well Performance
PH-2A (EW-5)	24	Well Performance/ Aquifer Characterization
PH-13 (EW-6)	8	Well Performance
PH-10 (EW-8)	8	Well Performance
RFW-5B (EW-7)	8	Well Performance

In addition, groundwater samples were collected during the week of 17 February 1992 as part of the quarterly groundwater sampling program initiated at the Black & Decker facility based on agreement with the MDE Groundwater Investigation Division. Groundwater samples were collected at seven of the ten recovery wells and were analyzed for VOCs. Additionally, inorganic parameters (alkalinity, chloride, hardness, sulfate, total dissolved solids, and total suspended solids) were analyzed at six of the eight wells included in the quarterly sampling program. The purpose of collecting the groundwater samples was not only to characterize general groundwater quality, but also to quantify the levels of contamination present to aid in the design of the groundwater treatment system. The additional parameters were analyzed to evaluate whether pretreatment would be required prior to air-stripping to prevent scaling, bio-fouling, etc.

2.5 REMEDIATION SYSTEM OPERATION ACTIVITIES

During 1994, Black & Decker completed construction of the groundwater remediation system and, in August 1994, after MDE approval of the air, water appropriation and NPDES permit applications, the groundwater remediation system began operation. The following subsections summarize the on-going field activities that are conducted as a part of Weston's remedial system operation.

2.5.1 Quarterly Groundwater Sampling

Based on an agreement with the MDE Groundwater Investigation Division, groundwater samples have been collected during February, May, August, and November, since February 1992, as part of the quarterly groundwater sampling program initiated at the Black & Decker facility. Groundwater samples are collected from the ten recovery wells and 18 monitor wells and are analyzed for VOCs.

2.5.2 Water Level Measurements

After the startup of the treatment system, water level measurements were collected on a regular basis for the first two weeks, on a weekly basis for the next month, and then continued on a monthly basis. Water levels are measured in wells specified in the Water Appropriation Permit, issued by the Water Rights Division of the Maryland Department of Natural Resources.

SECTION 3
PHYSICAL CHARACTERISTICS

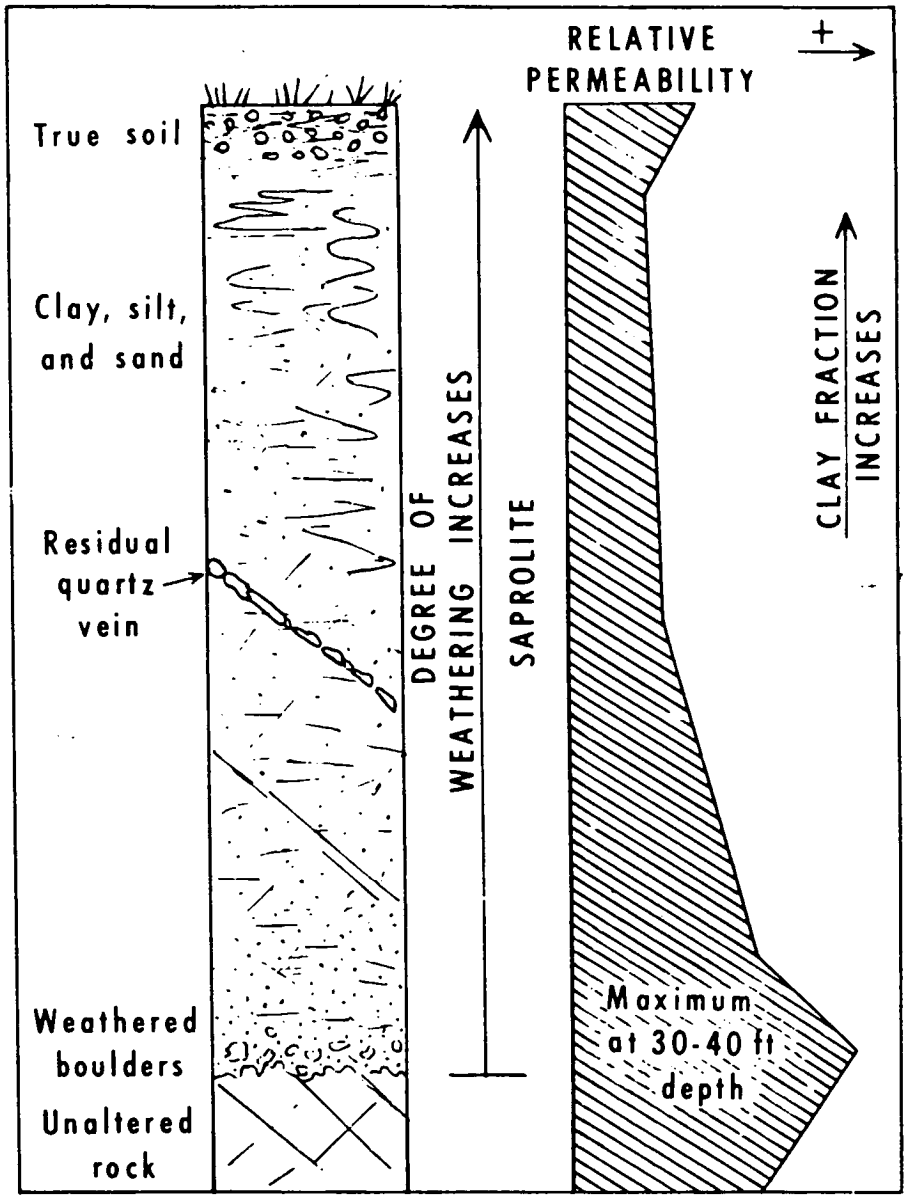
3.1 GEOLOGY

As in most of eastern Carroll County, an indeterminate thickness of the albite-chlorite schist facies of the Wissahickon Formation underlies the Black & Decker property. This facies consists principally of tightly folded albite schist or phyllite interbedded with layers of chlorite and or muscovite schist. Cream to yellow, vitreous, micaceous quartzite veins are locally present along the planes of foliation as well as transverse to primary foliation directions.

As is common in the Piedmont, the Wissahickon Formation underlying the site has been deformed and fractured. Zones of fracturing may have surface expression as valleys or subtle draws, or as other linear topographic features. Meyer (1958) reports that the principal strike of schistosity in the plant area ranges from N36°E to N46°E. However, because of the multiple deformational events in the regional geologic history, a wide variation in small-scale structural and relic bedding features is present.

The site stratigraphy is comprised primarily of weathered schist/phyllite, referred to as saprolite, that grades from a micaceous, clayey reddish-brown silt at shallow depths to a medium soft, grayish-brown, slightly weathered schist/phyllite near the interface with competent bedrock. Meyer (1958) describes this saprolite as being divided into two distinct zones described as a "soft, silty weathered schist" in the upper zone and a "firmer, less decomposed schist" in the lower or transitional zone between the saprolite and bedrock. Figure 3-1 presents an idealized profile of the zone of weathered rock in the Maryland Piedmont (Nutter and Otton, 1969).

This transitional zone is typical in the drilling logs collected at the Hampstead site. In general, the transitional zone between the saprolite and bedrock has an average thickness



Idealized weathering profile showing fresh crystalline rock grading upward into true soil.

Source: Nutter, L.J. and E.G. Otton, "Groundwater Occurrence in the Maryland Piedmont", Report of Investigations No. 10, Maryland Geological Survey, 1969.

FIGURE 3-1

Supplemental Remedial Work Plan
Black & Decker
Hampstead, Maryland

of 18 feet. It consists of slightly weathered green-gray schist with fractures and residual quartz veins encountered throughout the zone and with less fine-grained matrix than in the weathered rock encountered closer to the ground surface.

Twenty-nine of the forty well boreholes at the site (35 Weston installed monitor wells and 5 former production wells) have been advanced through the saprolite and into competent bedrock. Due to the gradational change between the saprolite and competent bedrock, as noted above, this interface is difficult to determine with certainty and is considered more of a "judgement call". However, based on the drilling logs, a bedrock topography map has been constructed and is presented in Figure 3-2. As can be seen in the figure, the depth to bedrock can be variable, especially in low-lying areas where the saprolite is generally thickest. However, this map is highly subjective due to the thickness and textural variability of the transitional zone between true saprolite and competent bedrock, as noted above. A distinct, well-developed textural contrast between saprolite and competent bedrock does not exist in the site area.

Based on best judgement, the depth to competent bedrock, or the thickness of the saprolite, ranged from approximately 32 to 119 feet bgs at the site, with an average of 76.2 ft bgs. Bedrock elevations varied mostly with surface topography and ranged from approximately 704.8 (PH-7) to 824.3 (RFW-19) feet MSL. The average bedrock elevation was 755.2 feet MSL. In addition, an isopach map showing the thickness of the saprolite is presented in Figure 3-3.

3.2 HYDROGEOLOGY

3.2.1 Regional Hydrogeology

In the Hampstead area, groundwater occurs predominately in secondary porosities (fractures, joints and shear zones) within the Wissahickon Formation, and in the pore spaces of the overlying transitional zone or lower part of the saprolite. Recharge to the

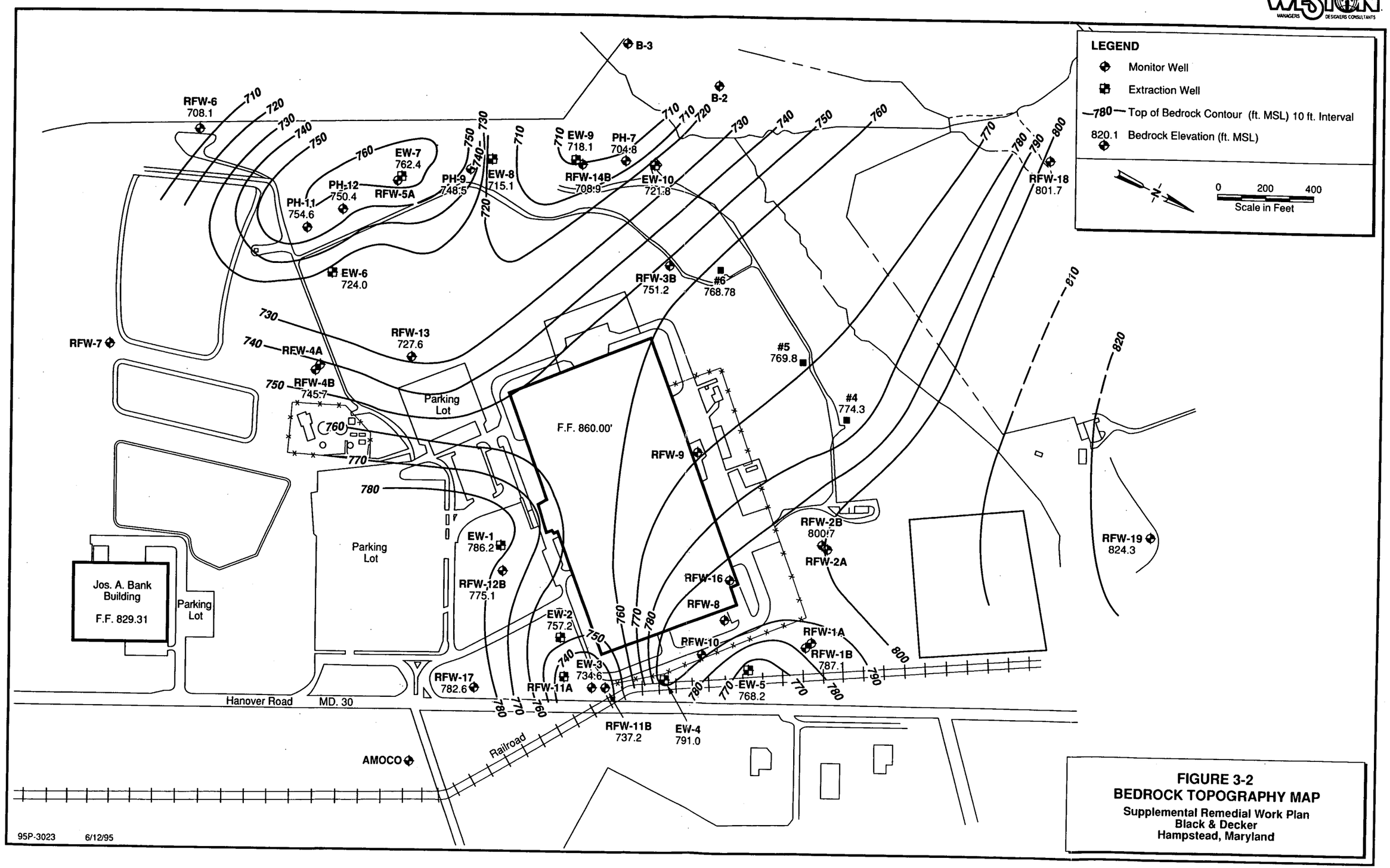


FIGURE 3-2
BEDROCK TOPOGRAPHY MAP
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