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Remedial Response

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September 1987

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Superfund Record of Decision:

Haviland Complex, NY

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16. ABSTRACT

The Haviland Complex site consists of a planned development comprising 275 acres in the town of Hyde Park, NY. This development contains an apartment complex, a junior high school, an elementary school, a shopping center and a number of private homes. Beginning in October 1981, a local resident filed a complaint with the Dutchess County Health Department noting that his well water was foaming. Other complaints of water quality supply problems prompted a sampling program and sanitary survey of the Haviland area. Results of these tests indicated failure in nearby car wash and laundromat septic and sewage systems. In 1982, the laundromat installed a sand filter and a new tile field to handle the laundry effluent. Due to increasing concern over potential ground water contamination by volatile organic chemicals, the New York State Department of Health (NYDOH) began sampling wells in December 1982. In January 1983, the laundromat was ordered to disconnect the dry cleaning unit from the recently upgraded sewer disposal system and dispose of all spent cleaning fluids offsite with a licensed disposal firm. Continued evidence of contamination led to installation of two spray aeration systems in Haviland Complex wells. The primary contaminants of concern include: volatile organic chemicals (TCE, DCE, toluene, benzene, vinyl chloride and 1,1,1-trichloroethane) and heavy metals (cadmium, chromium, mercury and lead).
(See Attached Sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

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EPA/ROD/R02-87/046
Haviland Complex, NY
First Remedial Action - Final

16. ABSTRACT (continued)

The selected remedial action includes: connecting affected and potentially affected Haviland Complex residences to the Harbound Hills water distribution system; ground water extraction and treatment by air stripping, with discharge to surface water; pumping and cleaning out contaminated sediments from the local septic disposal system; and implemention of a monitoring system to ensure effectiveness of the remedy. The estimated capital cost of the remedial action is $1,257,500 with annual O&M of $105,500.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Haviland Complex, Town of Hyde Park, Dutchess County, New York

STATEMENT OF PURPOSE

This decision document represents the selected remedial action for the Haviland site, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, November 20, 1985.

STATEMENT OF BASIS

This decision is based upon the administrative record for the Haviland Complex site. A copy of the record is available for review at the information repository for the site and at the regional office. The following documents, which are part of the administrative record, were primarily relied upon in making this decision:

- Remedial Investigation Report, Haviland Complex Site, prepared by Holzmacher, McLendon and Murrell, P.C. June 1987
- Feasibility Study Report, Haviland Complex Site, prepared by Holzmacher, McLendon and Murrell, P.C. July 1987
- The attached Summary of Remedial Alternative Selection for the Haviland Complex Site
- The attached Responsiveness Summary for the site, which incorporates public comments received
- Staff summaries and recommendations

DESCRIPTION OF SELECTED REMEDY

- Connect affected and potentially affected residents using ground water within the Haviland study area to the Harbourd Hills water distribution system. Implementation of this alternative requires a financial commitment on behalf of the Town of Hyde Park to upgrade the Harbourd Hills system to a level in compliance with New York State drinking water standards. The Town's contribution will be approximately 60%, depending upon final design details.

- Restore the aquifer to drinking water quality by extracting and treating contaminated ground water and discharging the effluent to surface water. Four strategically located extraction wells within the area of the contaminant plume will be required to offset the effects of ground-water mounding caused by the cessation of commercial/residential pumping and the addition of a public water supply. Local ground-water restoration will be provided by the use of a packed tower air stripper for volatile organics removal and a precipitation system for metals removal, if deemed necessary. Treated water will be discharged to the Fall Kill. It is expected that this treatment system will restore the aquifer to drinking water quality within a period of 5-10 years.

- Implement source control measures consisting of pumping and cleaning out contaminated sediments from local septic disposal systems in order to minimize the potential of additional releases.

- Implement a monitoring program to ensure the effectiveness of the extraction/treatment alternative and the protection of public health and the environment.

These methods were determined to provide the highest degree of protection to public health and the environment from contaminated ground water.

DECLARATIONS

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces the toxicity, mobility or volume of hazardous substances, pollutants or contaminants as a principal element. Finally, it is determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The State of New York has been consulted and agrees with the approved remedy (see attached letter).

The action will require future operation and maintenance activities to ensure the continued effectiveness of the remedy. The start-up activities, which will ensure the operational effectiveness of the design, will be considered part of the approved remedial action and eligible for Superfund monies for a period of up to one year. Additionally, up to ten years of aquifer remediation will also be considered remedial action which is eligible for Superfund monies. The remainder of the activities are considered operation and maintenance and are therefore the responsibility of New York State.

I have also determined that the action being taken will be appropriate when balanced against the future availability of Trust Fund monies for use at other sites.

September 30, 1987
Date

Christopher J. Daggett

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
HAVILAND COMPLEX
NEW YORK

United States Environmental Protection Agency
Region II
New York

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I. SITE LOCATION AND DESCRIPTION

The study area for this Remedial Investigation/Feasibility Study (RI/FS) covers 275 acres (0.43 square miles) in the Town of Hyde Park, New York (Figure 1) and includes an apartment complex, a junior high school, an elementary school, a shopping center and a number of private homes. The Haviland Complex site includes areas along Haviland Road, Wright Avenue and Route 9G, and is situated east of the FDR National Historic Site. The site area includes residential and non-residential wells.

The Town of Hyde Park is located within the northern extension of the Great Appalachian Valley within the Valley and Ridge province. Drainage systems are not well developed in the area which lead to numerous swampy conditions. The prinicipal aquifer underlying the site is composed of stratified sand and gravel outwash which is recharged directly by precipitation. These stratified deposits are generally the most productive sources of ground-water in the area but are of limited extent.

Unconsolidated deposits are composed primarily of fractured slate and shale, lesser amounts of sandstone, limestone, and conglomerate. Most residents rely on shallow wells in the surficial sand and gravel aquifer. The majority of businesses and institutions utilize the unconsolidated, bedrock aquifer. Ground-water flow in the area is generally in a southeast direction towards the Fall Kill.

II. SITE HISTORY

The Haviland Apartments were constructed in the middle 1960's, with the adjacent shopping center and most of the local residences already existing (Figure 2). The local laundromat and dry cleaner, situated in the middle of the shopping center, have been in operation since the late 1960's.

Dutchess County Health Department documents note complaints concerning area ground-water quality beginning in October 1981. At this time, a local resident had registered a complaint that his well water was foaming and suggested that the Haviland Laundromat's sewage disposal system was failing. Shortly thereafter, concerns were voiced regarding water quality supply problems at the Haviland Apartments.

A sampling program and sanitary survey of the Haviland area, focusing on detergent and bacteriological parameters, began on December 2, 1981. During this month, the Haviland Laundromat sewage disposal system and two residential sewage disposal systems were tested by introducing dye into the systems and sampling for any residue in local wells. The results of these tests showed no direct contamination of area wells. Dye testing of the laundromat sewage system continued through January 1982 with negative results. However, the laundromat effluent was found to exceed ground-water standards set by the New York State Department of Environmental Conservation.

Continued testing of the laundromat sewage system confirmed that it was failing, when positive dye test results were obtained on February 1, 1982. This prompted additional testing of commercial sewage disposal systems within the Haviland Complex.

On March 26, 1982, the Dutchess County Department of Health found that the Haviland Car Wash septic system was failing . The Car Wash was also exceeding New York State Department of Environmental Conservation ground-water standards for effluent discharge. Subsequently, the old septic tank was replaced with a new one.

Additional study of the sanitary and water supply system at the Haviland Complex by the Dutchess County Department of Health continued through the Spring of 1982. On April 27, 1982, notice was given to disconnect a shallow (22') well located at the southeast corner of the apartment complex, from the Haviland Complex community water supply system. This well was installed during the previous winter, with the intention of using it solely to supply the laundromat. This added water source was planned to help the apartment complex eliminate the need to truck in water to supplement the potable well water supply. The Haviland Laundromat was also advised to implement a biological or pretreatment system (a sand filter) designed for the laundromat wastewater discharge.

Construction of a sand filter and tile field pad to handle the laundromat effluent was proposed and completed by December 1982. Concurrently, plans were made by the Dutchess County Department of Health to increase the scope of ground-water monitoring around the Haviland Complex. In particular, analyses of water samples were proposed to determine the presence of volatile organics.

Due to increasing concern over potential ground-water contamination by volatile organic chemicals in the Haviland Complex area the New York State Department of Health began sampling in December 1982. Subsequently,on January 19, 1983 the Haviland Laundromat was informed by the Dutchess County Department of Health that it should physically disconnect the dry cleaning unit from the recently upgraded sewage disposal system. All spent dry cleaning fluid was then to be barreled and removed from the site by a licensed carter.

In 1984, as a result of concentrations of trans-dichloroethene in the 20-60 ppb range, a spray aeration system was installed at one of the Haviland Apartment Complex wells. In 1985, a similar treatment system was installed for the contaminated well supply of the Haviland Laundromat. This well is located on the apartment complex property. Both treatment units are monitored by both the Dutchess County and New York State Departments of Health.

On June 14, 1985, the New York State Department of Environmental Conservation (NYSDEC) requested that the U.S. Environmental Protection Agency (EPA) perform an immediate removal action to provide potable water to all affected residences within the study area. On September 3, 1985, EPA submitted a reply to NYSDEC indicating that the Haviland Complex Site did not meet the criteria established under the National Contingency Plan (NCP) for an immediate removal action, since the contamination levels were below EPA's 10-day Health Advisory levels for drinking water.

The Haviland Complex site was placed on the National Priorities List (NPL) in October 1984. The hydrogeologic investigation, the first step in the RI/FS process, began in August 1986 when a seismic survey was performed to provide insight into the bedrock locations and characteristics. Soil gas probing via HNu photoionization analyzer and an Organic Vapor Analyzer indicated high VOC readings and hot spots in the area of the tile fields. This was followed by the installation of 12 PVC piezometers to determine ground-water flow direction and 21 stainless steel monitoring wells (Figures 3 and 4) designed to obtain water quality and geologic information (i.e., depth to bedrock, hydraulic conductivity, etc.) in the study area. Geophysical logging investigations were also performed to evaluate the integrity of the bedrock. These investigations indicated that the bedrock yields little water and is not extensively fractured, and that ground water generally flows in a southeast direction toward the Fall Kill Creek.

After ground-water flow directions were established, 21 stainless steel monitoring wells were installed to sample for water quality parameters. These wells were located upstream of suspected sources of contamination, immediately downstream of the suspected sources and across the suspected flow of the contaminant plume. In addition, two bedrock wells were installed to evaluate the water quality and the hydraulic connection between the bedrock and overlying unconsolidated material. In some instances, contaminant levels were above the Safe Drinking Water Act's (SDWA) maximum contaminant levels (MCL) for drinking water.

Analysis of ground water at the Haviland Site indicated the metal contaminants- cadmium, chromium, mercury, selenium, silver, lead and arsenic, and volatile organics- benzene, styrene, toluene, 1,1-dichloroethene, trans-1,2-dichloroethene, acetone, methylene chloride, chlorobenzene, vinyl chloride, 1,1,1-trichloroethane, xylene, dichlorobenzene, trichloroethene and tetrachloroethene at concentrations ranging from trace quantities to excess of Federal and/or State drinking water standards (Tables 1,2,3,4). Further ground-water sampling would be conducted during the initial stage of the design phase in order to verify the presence of any metals.

The primary environmental exposure route of chemical contaminants at the Haviland Complex site is from drinking ground water and inhalation of volatile organic vapors while showering. Surface-water exposure via ingestion of fish from the Fall Kill and from soil was determined to be very low. Water quality analyses of the Fall Kill appear in Table 5.

The total cancer risk for each organic chemical ranged from 10^{-3} to 10^{-6} in order of magnitude. Vinyl chloride represented the highest potential risk (10^{-3} or 1 in 1000), while trichloroethylene the least (10^{-6} or 1 in 1,000,000) in the receptor area. These values are indicative of a worst case total lifetime exposure to maximum organic concentrations at an assumed constant rate. All noncarcinogenic contaminants were within acceptable intake levels, based on their respective subchronic and chronic intakes. Therefore, there are no health hazards based on these data at this point in time.

The source of contamination appears to be a number of septic systems in the area. These septic systems are connected to the Haviland Shopping Center, the Haviland Complex Apartments, and the Haviland Junior High School (Figure 5). The plume of contamination extends downstream of the sources, flowing south-southeast to near Haviland Road, traveling along Haviland Road, crossing Sunset Road between Haviland Road and Wright Avenue and eventually discharging to the Fall Kill (Figure 6). Water quality samples were taken of the Fall Kill and indicated that there was no significant impact by the plume.

Fourteen samples were collected from several commercial and institutional septic disposal systems at the Haviland Complex and adjacent junior high school facilities on June 12 and 13, 1987. Detectable levels of volatile organics were found in ten of the fourteen samples (Table 6). With the exception of five samples, inorganic compounds were detected at concentrations above their respective New York State Class GA Ground-water Discharge Standards (Table 7). Based on potential toxic effects from the consumption of heavy metals, contaminants of concern include cadmium, chromium, lead, and mercury. These metals were detected at concentrations up to 97 ppb for cadmium, 328 ppb for chromium, 1840 ppb for lead, and 330 ppb for mercury.

III. ENFORCEMENT

No negotiations with potentially responsible parties (PRP's) have been conducted up to the present. Data in the RI/FS indicates that the most likely locations where contamination entered the ground water were the septic systems connected to the Haviland Shopping Center, the Haviland Apartments, and Haviland Junior High School.

Prior to the initiation of the remedial design, notice letters will be sent to the potentially responsible parties. Should the PRP's decline to conduct future remedial activities, EPA will provide funding for such activities, but will retain its right to seek cost recovery for all EPA-funded response actions from said PRP's.

IV. COMMUNITY RELATIONS

The primary concern of the community at the Haviland Complex site is for a safe domestic water supply. Although most residents no longer drink or cook with their water, they are concerned about the long-term effects of the contaminated water they may have consumed for an undetermined period prior to learning that a water problem existed. Several residents expressed the belief that their community is experiencing a higher-than-average incidence of certain types of cancers.

Interest in this site is relatively high, and some individuals have been extremely active in focusing attention on the site. Although residents have held meetings in their homes and attended regular meetings of the town council, no groups have been formed as a result of the Haviland Complex site. A public meeting was held on August 17, 1987 at the Hyde Park Town Hall to discuss the RI/FS. The attached responsiveness summary outlines the numerous concerns of the public and the responses given by EPA and State officials. A transcript of the meeting is also available at the information repository and at the regional office.

The community generally agrees that the extension of the Harbourd Hills water supply to affected residents would be the best method for providing potable water.

V. ALTERNATIVES EVALUATION

The objective of the Feasibility Study was to evaluate and recommend a cost effective remedial action alternative which would minimize the risk to public health and the environment resulting from ground-water contamination at the site. Remedial action alternatives were subjected to a qualitative, preliminary screening based on technical feasibility, environmental, public health and order of magnitude cost criteria. Originally, eleven alternatives were evaluated; the screening process left only five for final consideration.

These remaining five were evaluated on the same basis but in a more detailed quantitative and qualitative manner. The following is a summary of the detailed evaluation presented in the Feasibili. Study report dated July 17, 1987. The numbering system below is taken directly from the Feasibility Study.

A - Alternative No. 1 - No Action

This alternative does not provide for any remedial action for cleanup of the site. Ground-water contaminants identified during the RI which pose a threat to the public and the environment, include arsenic, cadmium, chromium, lead, mercury, selenium, silver and a variety of organic compounds including benzene, 1,1-dichloroethene, dichlorobenzene, styrene, tetrachloroethylene, toluene, 1,1-trichloroethane, trichloroethylene, and xylenes.

While not all of the private wells which supply the approximately one hundred (100) residential units in the study area show contaminant levels which exceed ground-water standards, it is not safe to assume that no further spreading of the plume will occur. Variations in contaminant source concentrations, seasonal rainfall and ground-water withdrawal patterns can alter the extent of the plume, thereby affecting private wells which are clean at this time. Although contaminant concentrations show a decreasing concentration over time, the most recent residential well sampling data (DCDOH, February 1987) indicate that five private well samples (14 Haviland Road, 20 Haviland

Road, 22 Haviland Road, 24 Haviland Road, and 21 Wright Avenue) contain contamination in excess of acceptable NYSDOH water quality standards (Figure 7). All five of these samples exceeded the State's guidelines of 50 ppb for a single volatile organic compound and/or 100 ppb for total volatile organics. An additional three residential well samples (6 Haviland Road, 8 Haviland Road, and 26 Haviland Road) showed detectable levels of volatile organics.

Wells which are now impacted are very likely to remain contaminated until the plume is naturally flushed out. Based on ground-water modeling, contaminant transport time between the source and the Fall Kill is estimated between 4 and 100 years (Figure 8), although most of the contamination is expected to naturally attenuate within 20 years. Users of well water from the Haviland area will continue to experience a potential public health risk from exposure to contaminated ground water.

This alternative does not satisfy the remedial action objectives. Adverse impacts to the environment which will result from taking no action include continued contamination to the glacial aquifer, with a long term possibility of drawing the plume into the bedrock aquifer. Contamination of the bedrock is uncertain as the location of deep bedrock recharge is unknown. Due to dilution and aeration no significant environmental impact is expected in the Fall Kill. Users of well water from the Haviland area will continue to experience a potential public health risk from exposure to contaminated ground water which exceeds State and Federal drinking water standards due to the presence of volatile organics and possibly metals.

Adoption of this alternative would require continuation of an ongoing sampling and analysis program by the Dutchess County Health Department. This would include monitoring of well water and ground-water quality as well as sampling from dry wells and septic systems which are suspected contaminant sources. There is no cost associated with the no action alternative (Table 8).

B - <u>Alternative No. 2 - Source Control</u>

Source control remedial action consists of cleaning out contaminated dry wells, septic disposal systems and tile fields located within the Haviland study area which may be contributing to the contaminated ground-water plume and evaluating waste management practices. Liquid and sediment samples were collected from several commercial and institutional septic disposal systems at the Haviland Complex and adjacent junior high school facilities for volatile organic and inorganic priority pollutant compounds. Locations of the samples are illustrated in Figure 5. Sampling was conducted on June 12th and 13th, 1987 to determine the extent of contamination in the sediments within the above structures. Detectable levels of volatile organics were found in ten of fourteen samples (Table 6). New York State Ground-Water Discharge Standards were used as the criteria for cleaning out the septic sludges since these standards are considered as applicable or relevant and appropriate. Elevated levels of cadmium, chromium, copper, lead, mercury and silver were detected at concentrations above their respective New York Class GA Ground-Water Discharge Standards (Table 7).

Septic disposal systems with sediments containing unacceptable levels of volatile organic and/or heavy metals contamination would be excavated and replaced with clean sand. Contaminated disposal systems with elevated levels of metals and/or volatile organics would be pumped out. Materials excavated or pumped from these structures would be disposed at a permitted hazardous waste disposal facility. The septic disposal systems would be resampled and analyzed to verify that contaminated sediments had been removed. The disposal system would then be reconstructed or backfilled with clean sand. In addition, the sediments excavated from these disposal systems would be sampled to insure that the material is properly disposed.

This alternative does not present any adverse public health impacts, rather it indirectly offers some protection to the public against continued contaminated ground-water exposure. It does not provide for aquifer remediation or provide a safe drinking water supply but, serves only as a partial remedy. Excavating and cleaning out of septic disposal systems would minimize future releases of contaminants, assuming no additional contaminants are being released into the septic systems. It is also recommended that the County and/or State utilize all available authority to ensure that future septic system contamination does not occur.

Ground water (private wells) and surface water (Fall Kill) are the primary receptors to the contaminant plume. Based on the surface-water samples collected from the Fall Kill during the RI, contaminants detected were at concentrations which would not impact a Class C surface-water body (Table 5). Assuming that contaminant concentrations are released from the disposal sources (i.e., dry wells, septic systems) at past concentrations, the Fall Kill would continue not to be impacted by the release. However, the cleaning out of disposal systems of any contaminated sediments would offer additional protection for the Fall Kill should the concentrations of contaminants being released to the ground-water increase significantly over time. The present worth cost for source control is estimated at $98,000 (Table 8).

C - <u>Alternative No. 4 - Ground-Water Extraction, Treatment and Discharge to Surface Waters</u>

This alternative includes aquifer restoration through containment and interception of the identified contaminant plume. Interception of contaminant-laden ground water would be accomplished through the use of 4 small diameter stainless steel wells which would supply water to a treatment facility. Proper sizing and location of these wells would result in containment of the plume through modification of the ground-water gradient caused by the cones of depression around each well.

Ground-water modeling was used to evaluate the effectivenees of several different pumping configurations. An efficient pumping strategy indicated placement of three wells roughly along the centerline of the inferred plume with an additional well on the south side of the plume. Figure 9 shows the locations of these wells. Each well would have a capacity of 20 gpm. The effectiveness of this configuration would depend upon implementation of source controls to prevent new contaminants from reaching the aquifer.

The identified plume would be removed through flushing of the contaminated ground water toward the four treatment wells. Small areas of the plume which are already near the Fall Kill will continue to migrate until they enter the creek.

Two treatment alternatives were evaluated for ground water contaminated with volatile organic compounds; packed tower air stripping and granular activated carbon adsorption. Both technologies are considered reliable and proven in the removal of volatile organics to low effluent concentrations. Worst case emmisions were calculated to be insignificant in comparison to New York State Standards.

Treatment technology for metals removal consists of pH adjustment and precipitation which is widely used in industrial wastewater treatment. However, this technology may not achieve a reduction in metals concentrations to the range of 10 ppb to 50 ppb (equivalent to drinking water standards) because of the variety of metals found. Therefore, there is a chance that the system could fail resulting in community consumption of water below drinking water standards. Removal efficiencies and effluent concentrations would depend largely on results determined from pilot studies. After metals treatment, the ground water would be treated through an air stripper and then would be disposed of via direct discharge to the Fall Kill. . The design would be based on SPDES requirements which would be the more stringent of the effluent limitation for a Class C water body or the water quality limitation for the Fall Kill. Recent tap-water samples taken from site residents by the New York State Department of Health indicate that metals are not a problem at the tap at this time; however, further aquifer sampling would be conducted to determine the need of metals treatment prior to discharge.

Ground-water extraction and treatment offers long range public health protection against contaminated ground-water consumption. Based on site hydrogeologic conditions, the time required to rehabilitate the aquifer to acceptable limits is estimated to be within 5 to 10 years, assuming no continued contaminated discharges. During the aquifer cleanup period, however, residents within the study area using private wells would continue to be exposed to contaminated ground water. Although the contaminant concentrations would continue to decrease over time, it would take at least 5 to 10 years before aquifer water quality is within acceptable drinking water levels. In the meantime, residents could utilize bottled water as their primary source of potable water for the duration of the cleanup. This, however, would pose a potential health threat through continued exposure to volatile organic compounds via inhalation, as well as the inconvenience to the public of using bottled water.

Aquifer rehabilitation would be accompanied by an annual ground-water monitoring program. The sampling and analysis would be conducted by the Dutchess County Department of Health and would utilize selected RI/FS monitoring wells, and private wells located on the west side of Route 9G and in the area south of Wright Avenue. Analytical data obtained from these wells would serve to demonstrate the progress of the aquifer remediation as well as monitor water quality in areas which were not previously impacted. Ground-water samples would be analyzed for priority pollutant metals and volatile organic parameters.

This alternative does not pose any significant long term adverse environmental impacts through its implementation. Pumping ground water from the aquifer for treatment should result in long range aquifer rehabilitation, subsequently reducing the extent of ground-water contamination. Four stainless steel extraction wells, screened in the surficial aquifer, each pumping continuously at 20 gpm, would be sufficient to contain and capture the contaminant plume. The contamination encountered in the bedrock aquifer will be cleaned up by natural dispersion which will occur upon cleanup of the upper aquifer and vertical gradients producing advective flow from the bedrock aquifer to the upper aquifer. If either the metals or volatile organics removal treatment system should fail temporarily, the water being discharged into the creek would have minimal anticipated impact on both surface-water quality and to segments of the public which may come into contact with the creek through recreational activities. This is primarily true as a result of turbulent stream flow conditions and dilution effects, even during low flow conditions. The present worth cost for this alternative is estimated at $802,200 with metals removal and air stripping and $289,800 with air stripping only.

D - Alternative No. 5 - Ground-Water Extraction, Treatment and Discharge As A Public Water Supply

This alternative is similar to Alternative No. 4, with the exception that the treated ground water would be used as a community potable water supply together with the existing Harbourd Hills water system. In addition to metals and volatile organics removal to meet Federal and State drinking water standards, treatment would include chlorine injection as a bacteriacide.

Four extraction wells would be located throughout the study area to capture the contaminant plume as discussed in Alternative No. 4. The wells would be screened in the glacial sand and gravel aquifer and would yield a minimum of 20 gallons per minute (gpm) each. A total of 80 gpm or 115,200 gallons per day (gpd) would be extracted from these wells with the additional water not consumed to be treated and wasted to the Fall Kill prior to chlorination.

Air stripping or carbon adsorption would be the technologies used to produce acceptable levels of volatile organics in the effluent. At a minimum, the ground water would be treated to an effluent concentration of 2 ug/l for vinyl chloride, 5 ug/l for benzene and trichloroethene, 7 ug/l for 1,1,-dichloroethene and 10 ug/l for any other single volatile organic constituent. Extensive pilot testing for metals removal must be conducted prior to actual implementation to determine optimal conditions for the process. Due to the presence of many metals in varying concentrations, removal efficiency to a concentration in the order of magnitude of 10 to 50 ppb may not be achievable. Therefore, if a breakdown in the system occurred, consumers would be drinking water that did not meet drinking water standards. However, recent testing of residential tap-water quality by the New York State Department of Health has indicated that metal contamination is not currently a problem and does not pose a health risk. Further design sampling and pilot testing will determine the need for metals treatment.

Upon treatment, the water would be discharged to the Harbourd Hills water system to supplement their existing supply. Upgrading of the Harbourd Hills treatment system to NYSDOH guidelines would be the responsibility of the owner of the water system at the time of implementation, although partial funding of said upgrading is included as part of this alternative to account for the increased capacity in need of treatment.

The pumping, treatment and discharge as a community water supply option would provide a high degree of protection to the public against exposure of contaminated ground water and, at the same time, reduce the extent of contamination in the aquifer.

Metal concentrations in the ground water may pose some risk to public health. The ground water would be treated for metals removal prior to distribution. Effluent design concentrations were determined based on Federal primary drinking water regulations. MCLs for cadmium, chromium, lead and arsenic are 10 ug/l, 50 ug/l, 50 ug/l, and 50 ug/l, respectively. The presence of many inorganic constituents in varying concentrations may have an adverse affect on removal efficiency. Federal MCLs may therefore not be achievable on a consistent basis.

This alternative would provide adequate protection against hazards to public health when both volatile organics and metals removal technologies are operating at the design removal efficiencies. However, failure of either of these systems, especially an unexpected breakthrough of VOC and/or toxic metals, would result in public exposure of contaminated ground water via ingestion. Proper management, operation and maintenance of the treatment system and frequent sampling and analysis of the water would help mitigate this risk. However, due to the uncertainties associated with the use of metals removal treatment technologies, safe levels of metals in the drinking water can not be assured. There are no anticipated adverse environmental impacts associated with this remedial action alternative. Pumping and treating the contaminated ground-water plume is a viable form of aquifer rehabilitation, assuming no additional contamination is being released. The present worth cost for this alternative is $1,558,100 and 1,045,700 with and without metals treatment, respectively.

E - Alternative No. 10 - Provide Public Water Supply To All Private Well Users Within The Study Area

Under this alternative, public water supply would be provided to current private well users within the Haviland study area by extending a water service main from the Harbourd Hills water system. An estimated 100 residences, which includes a 65-unit apartment complex, approximately 20 commercial businesses and a public school, would be connected to the community water system.

A new six-inch (6") main would be constructed along the existing easement, across the Fall Kill and onto Haviland Road to provide water service to the study area. The service extension would tie into the Harbourd Hills water system's existing 6-inch main on Lawrence Road. The existing 3-inch main servicing the Cedar Gardens apartment complex would be replaced with 1,300 feet of 6-inch main from the existing 6-inch main on Lawrence Road to the intersection of Haviland Road and Sunset Drive. The proposed service extension would provide public water to approximately 35 residential lots, a 65-unit apartment complex, a car wash, approximately 20 commercial businesses, and a public school (figure 10).

The existing Harbourd Hills Water Company supplies community water to a total of 214 residences and a 24-unit apartment complex in the Harbourd Hills section of the Town of Hyde Park. Current demands on water supply servicing these 238 units is 101,000 gpd. The new calculated average daily demand for both the existing Harbourd Hills Water Company plus the extended service to the Haviland study area totals 160,000 gpd.

Water for the Harbourd Hills water system is obtained from two production wells located on a two-acre parcel of land on Lawrence Road, east of the Fall Kill. As indicated in the RI, the Fall Kill acts as a hydrogeologic boundary for ground-water flow from the Haviland study area and therefore intercepts the contaminated ground-water plume before impacting the supply wells.

The quality of water obtained from the two Harbourd Hills supply wells does not meet current New York State Health Department regulations for iron, manganese and turbidity. The total maximum allowable concentration of iron and manganese collectively must not exceed 0.5 mg/l and the turbidity of the water must not exceed a value of 5 turbidity units throughout the distribution system. The combined iron and manganese concentrations, and the turbidity values detected in the Harbourd Hills distribution system currently exceed the allowable New York State Department of Health water quality criteria for community ground-water systems.

Another noted deficiency in the existing community water distribution system is inadequate storage capacity. The existing storage in the Harbourd Hills water system, with a capacity of 32,000 gallons, does not meet the minimum storage equal to the design average daily consumption, as required under state regulations. With the extension of the water company to include the Haviland area, the total average daily demand would equal approximately 160,000 gpd. An increase in storage capacity of at least eighty percent (80%) is needed to upgrade the system to conform with state requirements.

This alternative employs proven technologies for extending public water service to the Haviland study area. Based on maximum safe yields obtainable, the existing Harbourd Hills water system is capable of providing sufficient water capacity to meet the demands of both the existing water company and the extended service to the Haviland area. The estimated total average daily demand (160,000 gpd) represents approximately forty percent (40%) of the maximum safe yield obtainable (439,000 gpd) from the two Harbourd Hills water production wells. The facilities to extend the Harbourd Hills community water system into the Haviland study area would require approximately 5,500 feet of six-inch (6") diameter ductile iron pipe, six (6) gate valves, approximately sixty (60) service connections and six (6) six-inch hydrants.

The existing water treatment and distribution system must be upgraded and expanded to meet New York State Department of Health community ground-water requirements. Deficiencies in the existing treatment and distribution system will be corrected using proven effective technologies to meet State design criteria. Proposed technologies for upgrading and expanding the existing Harbourd Hills water supply treatment, storage and distribution system are discussed in detail in the Morris & Andros Feasibility Report (1985), conducted for the Town of Hyde Park. As discussed in the Feasibility Study, the cost of upgrading the Harbourd Hills system will be shared by the Town and EPA/New York State under this action. The contribution by the Town will be approximately 60%, depending upon final design details. Under this action, EPA and New York State are only responsible for that portion of the upgrading allocable to the volume associated with this study area.

This alternative provides a high degree of protection to the public against exposure to contaminated ground water by providing all private well users within the Haviland study area with an alternate community water supply. Residents would no longer be using water from the contaminated plume as a potable or domestic water source.

Impacts to the environment resulting from the implementation of this alternative would consist of fluctuations in the elevation of the water table and local disturbances due to construction and installation of the new service mains. In addition, it would not provide for aquifer restoration.

The fluctuations to the water table elevation are predicted due to the proposed cessation of ground-water withdrawal for residential and commercial use, coincident with the continuation of ground-water recharge through the existing septic systems. The land west of the study area now drains into the Maritje Kill, while the study area and land to the south and east drain into the Fall Kill. Modeled ground-water contours and flow directions (Figures 10 and 11) predict the formation of a local ground water "mound" south of the Haviland Complex leaching fields. This predicted local increase in water table elevation could cause a shift in the ground-water divide toward the east which would result in contaminant migration west of Route 9G and south to the area of Woodfield Avenue. The existing gradients causing contaminant transport south toward Roosevelt Road would be increased, thereby hastening the advance of the contaminant plume. Therefore, this alternative is not considered adequate without aquifer remediation to ensure protection of potentially affected residences to the south and the southwest.
Residents to the south and southwest using private wells along and between Route 9G and Sunset Avenue should be monitored semi-annually for potential volatile organic and metals contamination from the Haviland Complex Wells site contamination plume

as a result of localized ground-water mounding. No significant long-term impacts are anticipated to either the topography or the Fall Kill.

Upon correcting the deficiencies in the existing treatment and distribution system, as recommended in the Morris & Andros Feasibility Report (1985), the Harbourd Hills water supply system would be within Federal and State requirements for a community ground-water distribution system.

Monitoring of private residential wells to the south and southwest of the study area for volatile organic and metal contaminants should be implemented by the Dutchess County Department of Health. Sampling and analysis of well water should be conducted on a semi-annual basis. The present worth cost for this alternative is $1,133,600.

VI. SELECTED REMEDY

A - Description

The selected remedial action for the Haviland Complex site, as presented in Table 9, consists of Alternative No.2 - Source Control, Alternative No. 4 - Aquifer Restoration and Alternative No. 10 - Alternate Water Supply. All three remedial actions must be implemented in order for the overall remediation plan to be effective. During the design phase of Alternate No. 4 the degree of treatment will be resolved based upon additional ground-water sampling and pilot testing i.e. whether or not metals treatment is necessary.

To reduce the risk of exposure to the public from contaminated ground water, an alternate potable water supply will be implemented by extending service from the neighboring Harbourd Hills water distribution system. Residents will no longer be using water drawn from the contaminant plume as a potable or domestic water source. It must be noted that this alternative requires a financial commitment on behalf of the Town to upgrade the Harbourd Hills system to a level in compliance with New York State drinking water standards. The costs depicted on Table 9 represent only the EPA/New York State share of the total upgrading costs. Approximately $500,000 in capital costs is required from the Town to implement this option.

Connection to public water service, however, may result in creating local ground-water mounds, causing migration of the existing contaminant plume into previously unaffected areas to the south and southwest of the site. In order to alleviate the potential of further spreading of contaminants and to provide a means for aquifer restoration, ground-water extraction wells will be installed to pump the contaminated ground water for treatment and ultimate discharge of the treated ground water to the Fall Kill.

The use of four ground-water extraction wells, three placed roughly along the center line of the inferred plume, and the fourth placed to the south-southwest of the study area will be utilized to capture altered contaminant flow caused by ground-water mounding. The calculated pumping rate of 20 gpm for each well should be sufficient for containing the contaminant plume.

Treatment of the contaminated ground water will require volatile organics and possibly inorganic contaminants removal. Use of a packed tower air stripper was chosen for volatile organics removal based on a present worth calculation of capital and O&M costs, as compared to use of granular activated carbon. Metals removal, if deemed necessary, will utilize a precipitation system. Additional ground-water quality samples will be analyzed during the design phase pilot study to identify and better quantify the presence of inorganics, in order to determine the need and extent of a metals removal system.

Aquifer restoration through pumping and treating will meet all Federal and State ARARs and is expected to be accomplished in 5 to 10 years. Aquifer remediation alone will not provide the private well users within the study area with acceptable potable water during the time period above; therefore, it is necessary to extend the Harbourd Hills water supply system to all impacted water users to provide protection to human health during this time frame.

In order for the ground-water pumping and treatment to effectively remediate the aquifer, source controls will need to be implemented from the outset. Source control measures consist of pumping and cleaning out contaminated sediments from local septic disposal systems in order to minimize the potential of additional releases. In addition, it is recommended that the County and/or State utilize all available authority to prevent a recurrence of such a problem through a septic tank monitoring and cleanup program.

A combination of Alternatives No. 2, 4, and 10 meets feasibility study objectives by providing an alternate acceptable source of potable water for private well users within the study area, and a cost-effective means of aquifer rehabilitation. The total cost of the remedial action plan is estimated at $2,033,800 expressed in terms of present worth over a 10-year project period for ground-water treatment and a 30- year project for public water service. Estimated capital costs are $1,257,500 and annual operating and maintenance costs are $105,500 for this remedial action plan.

B - Statutory Determinations

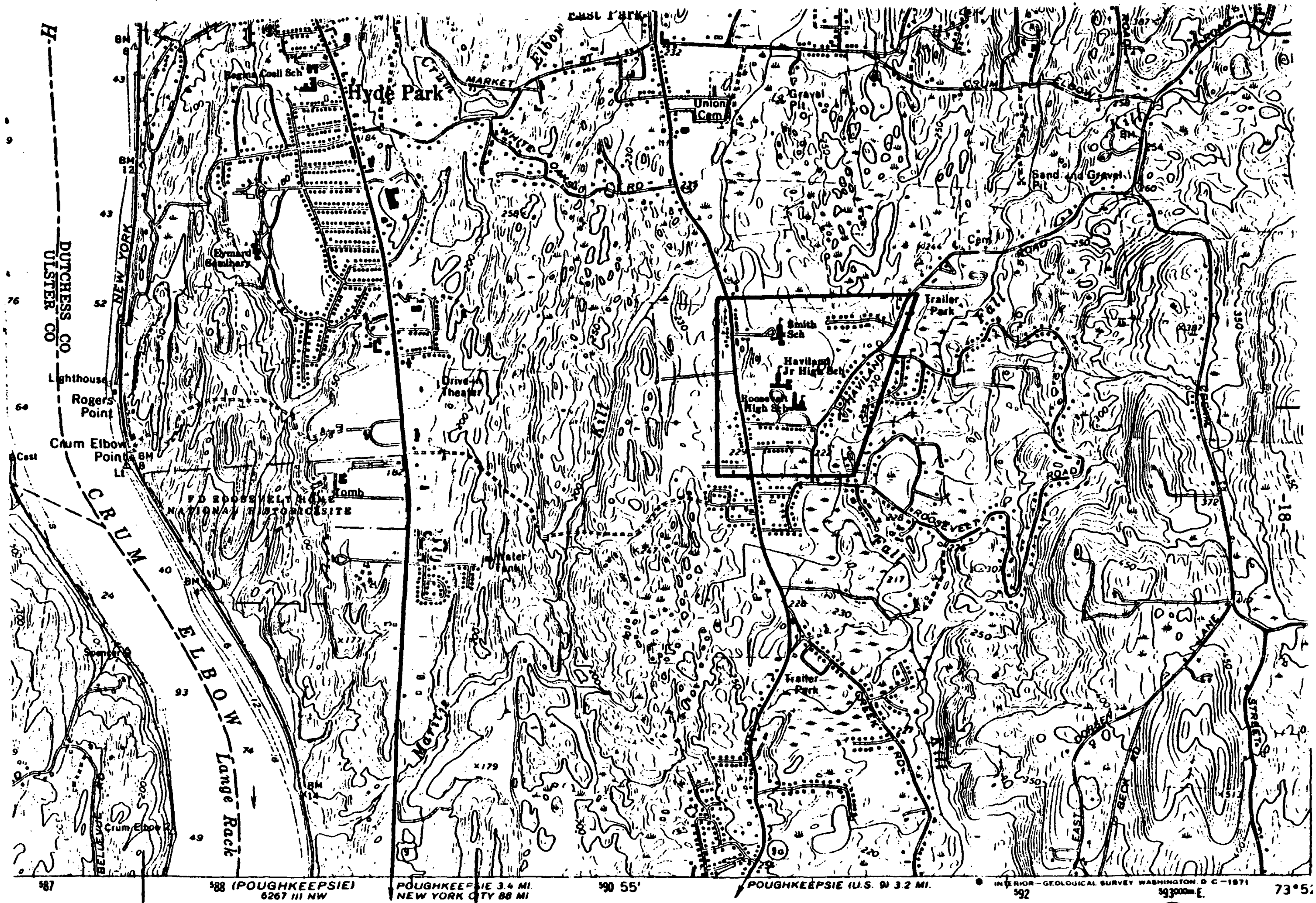
The selected remedy meets statutory requirements by:

1. Reducing public exposure to contaminated ground water by providing an alternate water supply.

2. Rehabilitating the aquifer by pumping and treating ground water to drinking water standards, source control, and preventing surface-water contamination by the discharge of contaminated ground water to the Fall Kill.

The remedy will meet all Federal and State ARARS by utilizing standards from the Safe Drinking Water Act (SDWA) which include the MCLs (maximum contaminant levels), New York Class GA Ground Water Standards and New York State Surface Water Quality Standards, and the Clean Water Act (CWA) which include ambient water quality criteria for surface and ground-water discharges and the National Pollutant Discharge Elimination System (NPDES). References for the list of contaminant-specific ARARs can be found in the Feasibility Study.

The principal environmental threats posed at the site are various volatile organic compounds and inorganic constituents (metals) in ground water. The threat of metal contamination to the public is not expected to be significant based upon results from recent tap-water samples. The remedy will utilize a combination of permanent solutions and treatment technologies to the maximum extent practicable which include source control (cleaning septic systems), alternate potable water supply (extending municipal water distribution system), extraction and treatment of contaminants in ground water by a metals precipitation method and/or air stripping for volatile organic compounds. This remedy represents the best combination of factors to achieve the preference for treatment to the maximum extent practicable. The selected remedy is also cost-effective and utilizes treatment technologies to the maximum extent practicable.



SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

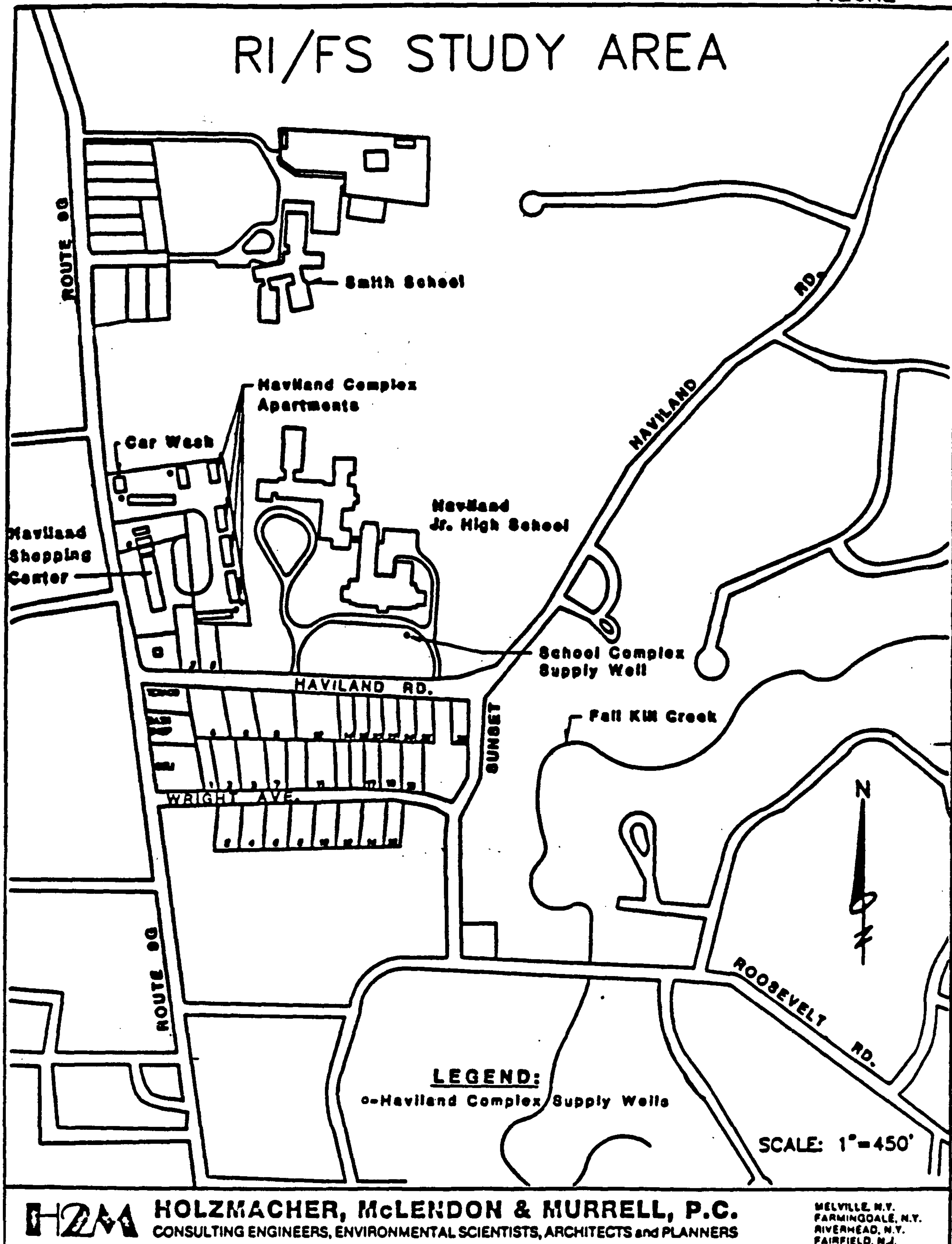
1 .5 0 1 KILOMETER

Figure 1

ROAD CLASSIFICATION

Heavy-duty Light-duty

FIGURE 2


RI/FS STUDY AREA
ROUTE 9G
Smith School
Haviland Complex Apartments
Car Wash
Haviland Shopping Center
Haviland Jr. High School
HAVILAND RD.
School Complex Supply Well
HAVILAND RD.
SUNSET
Fall Kill Creek
WRIGHT AVE.
N
ROUTE 9G
ROOSEVELT RD.
LEGEND:
o-Haviland Complex Supply Wells
SCALE: 1"=450'
H2M
HOLZMACHER, McLENDON & MURRELL, P.C.
CONSULTING ENGINEERS, ENVIRONMENTAL SCIENTISTS, ARCHITECTS and PLANNERS
MELVILLE, N.Y.
FARMINGDALE, N.Y.
RIVERHEAD, N.Y.
FAIRFIELD, N.J.

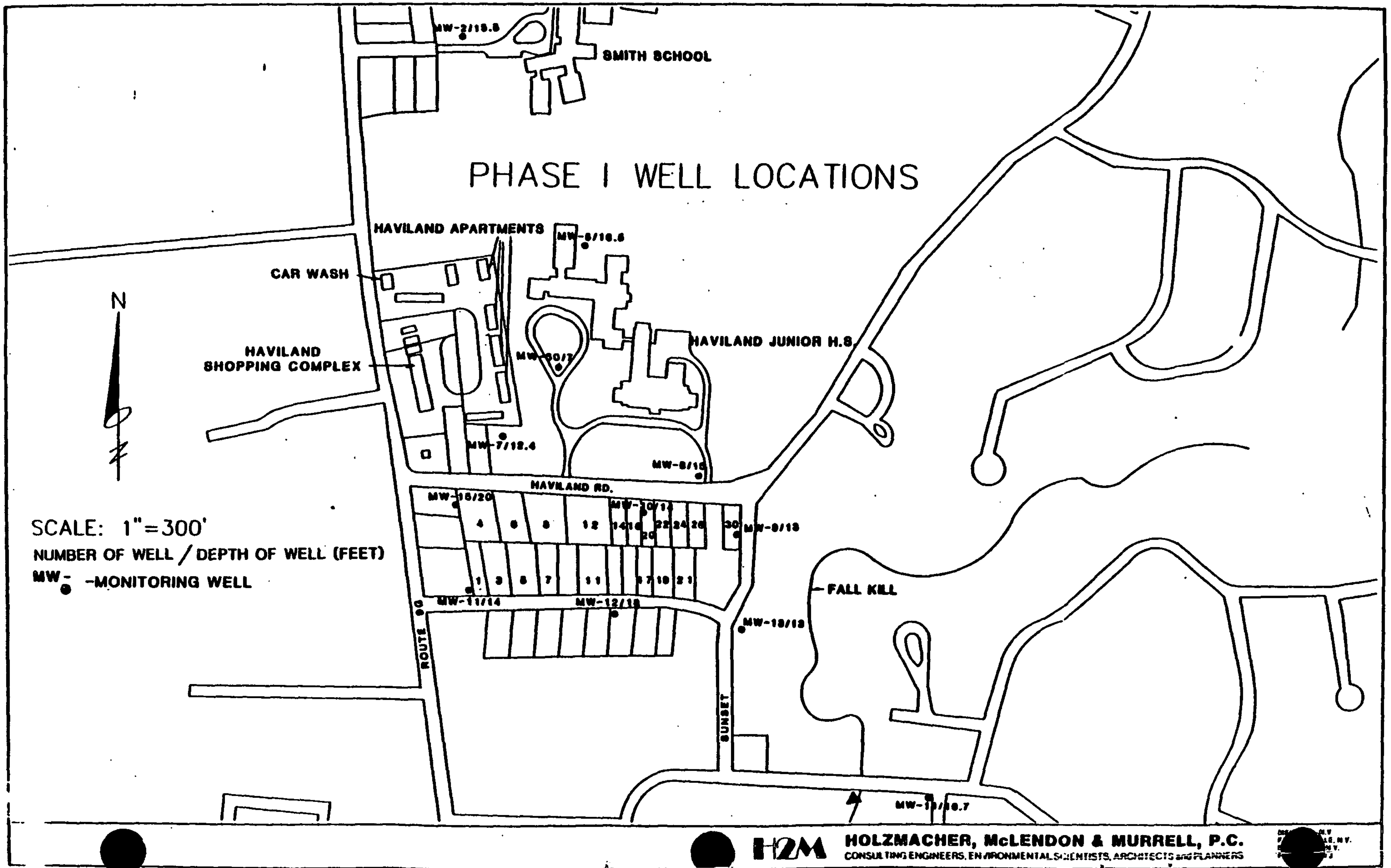

PHASE I WELL LOCATIONS
SMITH SCHOOL
HAVILAND APARTMENTS
CAR WASH
HAVILAND
SHOPPING COMPLEX
HAVILAND JUNIOR H.S.
MW-7/12.4
HAVILAND RD.
MW-9/13
MW-11/14
MW-13/13
FALL KILL
ROUTE 9G
SUNSET
N
SCALE: 1"=300'
NUMBER OF WELL / DEPTH OF WELL (FEET)
MW- -MONITORING WELL
H2M
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Figure 3

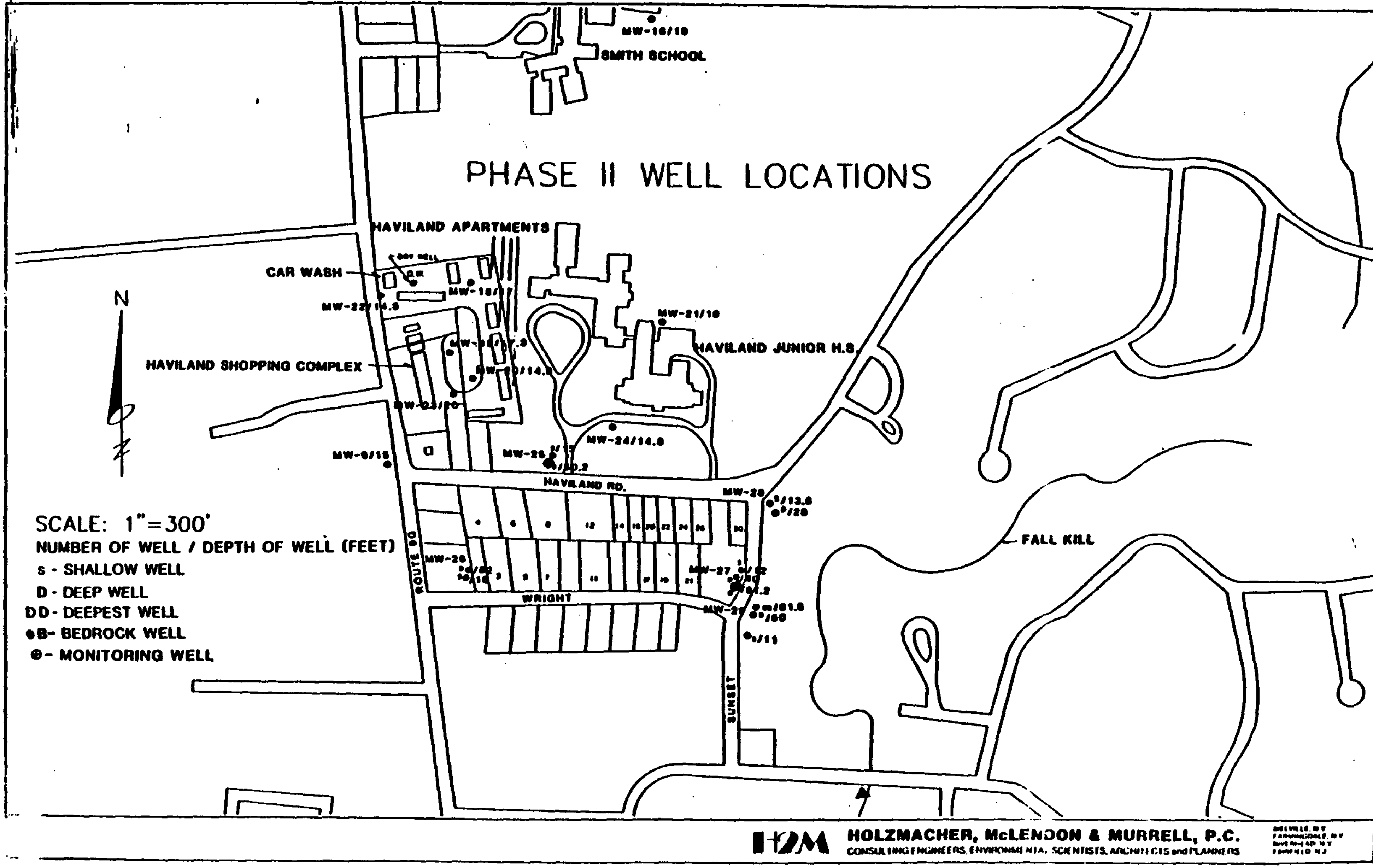
PHASE II WELL LOCATIONS
MW-16/10
SMITH SCHOOL
HAVILAND APARTMENTS
CAR WASH
MW-21/10
HAVILAND JUNIOR H.S.
HAVILAND SHOPPING COMPLEX
MW-24/14.8
MW-6/15
HAVILAND RD.
FALL KILL
ROUTE 9G
WRIGHT
SUNSET
N
SCALE: 1"=300'
NUMBER OF WELL / DEPTH OF WELL (FEET)
s - SHALLOW WELL
D - DEEP WELL
DD - DEEPEST WELL
●B- BEDROCK WELL
⊕- MONITORING WELL
H2M HOLZMACHER, McLENDON & MURRELL, P.C.
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Figure 4

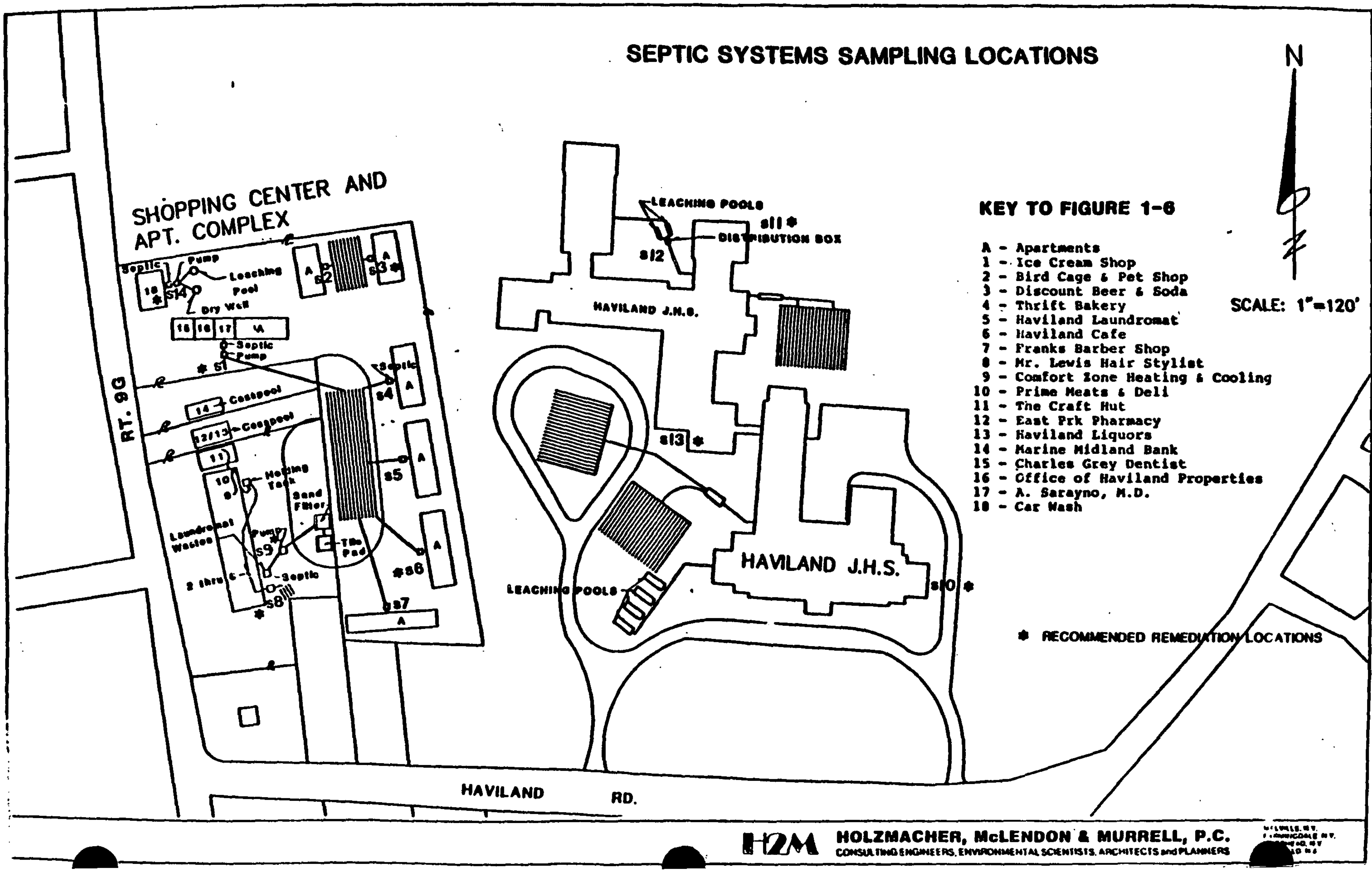
SEPTIC SYSTEMS SAMPLING LOCATIONS
N
SCALE: 1"=120'
SHOPPING CENTER AND APT. COMPLEX
RT. 9G
HAVILAND RD.
HAVILAND J.H.S.
LEACHING POOLS
DISTRIBUTION BOX
KEY TO FIGURE 1-6
A - Apartments
1 - Ice Cream Shop
2 - Bird Cage & Pet Shop
3 - Discount Beer & Soda
4 - Thrift Bakery
5 - Haviland Laundromat
6 - Haviland Cafe
7 - Franks Barber Shop
8 - Mr. Lewis Hair Stylist
9 - Comfort Zone Heating & Cooling
10 - Prime Meats & Deli
11 - The Craft Hut
12 - East Prk Pharmacy
13 - Haviland Liquors
14 - Marine Midland Bank
15 - Charles Grey Dentist
16 - Office of Haviland Properties
17 - A. Sarayno, M.D.
18 - Car Wash
* RECOMMENDED REMEDIATION LOCATIONS
Septic
Pump
Leaching Pool
Dry Well
Cesspool
Holding Tank
Sand Filter
Tile Pad
Laundromat Wastes
2 thru 6
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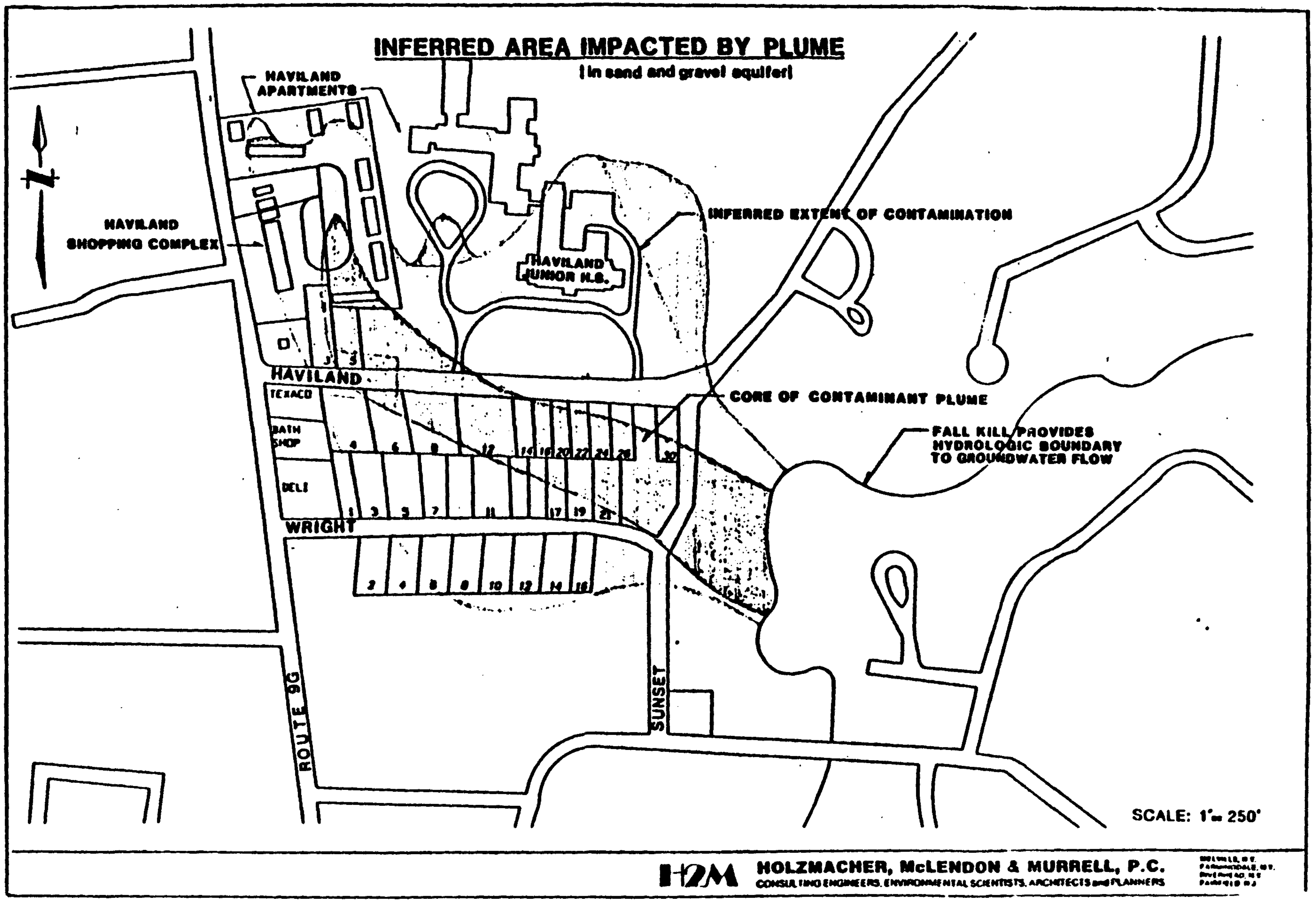
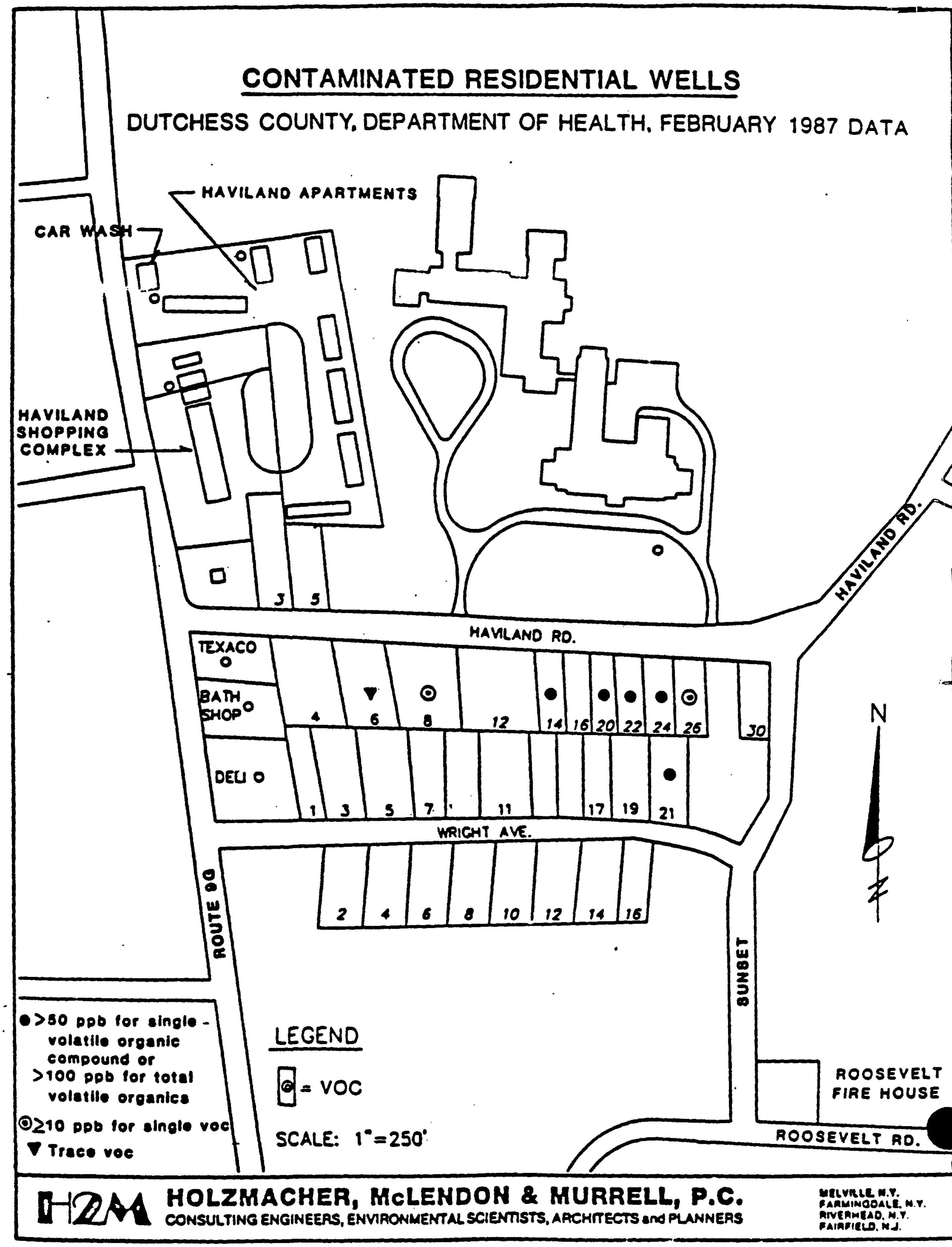
Figure 5

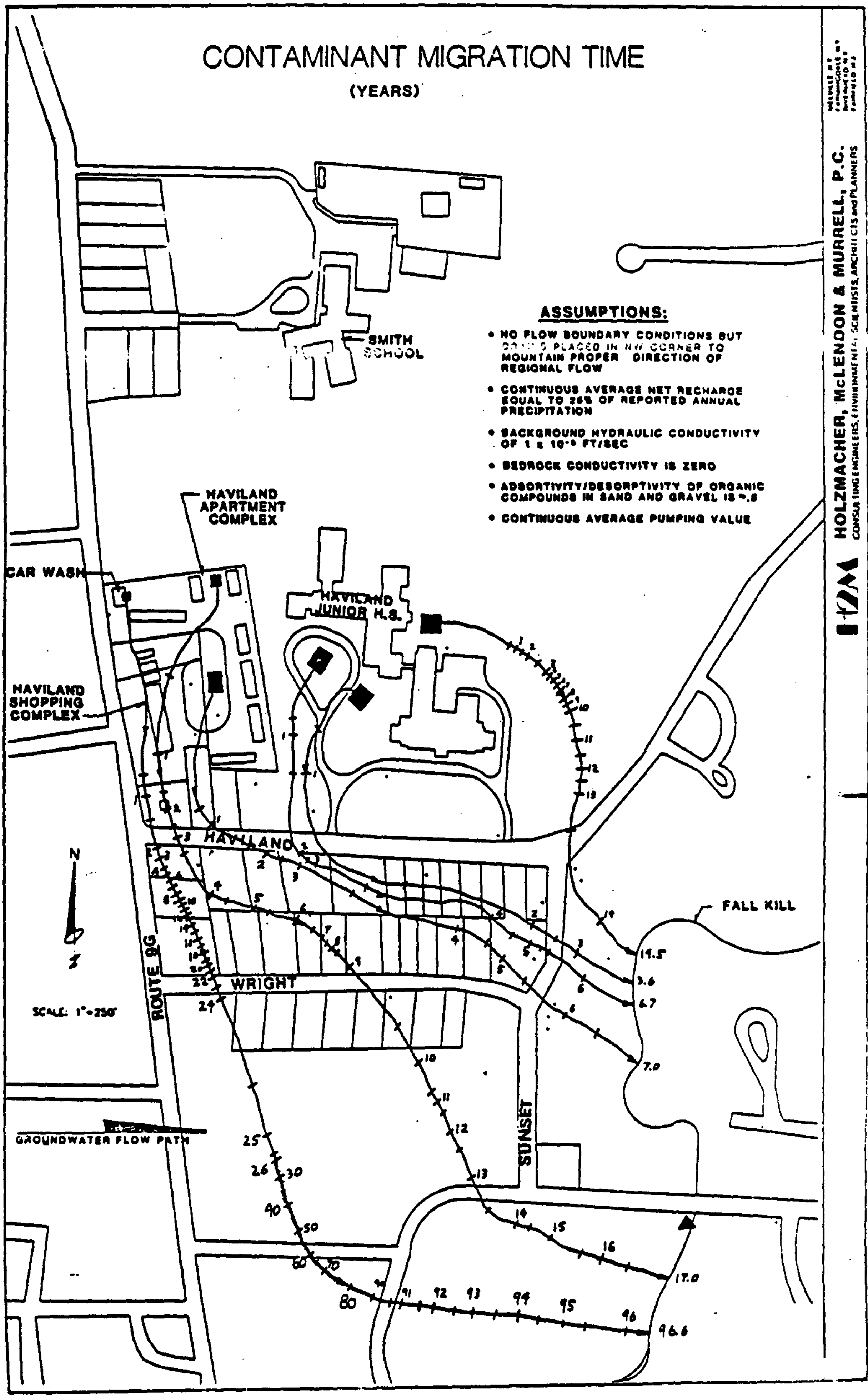


INFERRED AREA IMPACTED BY PLUME
(in sand and gravel aquifer)
HAVILAND APARTMENTS
HAVILAND SHOPPING COMPLEX
HAVILAND JUNIOR H.S.
INFERRED EXTENT OF CONTAMINATION
CORE OF CONTAMINANT PLUME
FALL KILL PROVIDES HYDROLOGIC BOUNDARY TO GROUNDWATER FLOW
HAVILAND
TEXACO
BATH SHOP
DELI
WRIGHT
ROUTE 9G
SUNSET
SCALE: 1" = 250'
HOLZMACHER, McLENDON & MURRELL, P.C.
CONSULTING ENGINEERS, ENVIRONMENTAL SCIENTISTS, ARCHITECTS and PLANNERS

Figure 6

Figure 7


CONTAMINATED RESIDENTIAL WELLS
DUTCHESS COUNTY, DEPARTMENT OF HEALTH, FEBRUARY 1987 DATA
HAVILAND APARTMENTS
CAR WASH
HAVILAND SHOPPING COMPLEX
HAVILAND RD.
TEXACO
BATH SHOP
DELI
WRIGHT AVE.
ROUTE 9G
SUNSET
HAVILAND RD.
N
ROOSEVELT FIRE HOUSE
ROOSEVELT RD.
3
5
4
6
8
12
14
16
20
22
24
26
30
1
3
5
7
11
17
19
21
2
4
6
8
10
12
14
16
● >50 ppb for single - volatile organic compound or >100 ppb for total volatile organics
◎≥10 ppb for single voc
▼ Trace voc
LEGEND
◎ = VOC
SCALE: 1"=250'
H2M HOLZMACHER, McLENDON & MURRELL, P.C.
CONSULTING ENGINEERS, ENVIRONMENTAL SCIENTISTS, ARCHITECTS and PLANNERS
MELVILLE, N.Y.
FARMINGDALE, N.Y.
RIVERHEAD, N.Y.
FAIRFIELD, N.J.


CONTAMINANT MIGRATION TIME
(YEARS)
ASSUMPTIONS:
• NO FLOW BOUNDARY CONDITIONS BUT PLACED IN NW CORNER TO MOUNTAIN PROPER DIRECTION OF REGIONAL FLOW
• CONTINUOUS AVERAGE NET RECHARGE EQUAL TO 25% OF REPORTED ANNUAL PRECIPITATION
• BACKGROUND HYDRAULIC CONDUCTIVITY OF 1 x 10⁻⁵ FT/SEC
• BEDROCK CONDUCTIVITY IS ZERO
• ADSORTIVITY/DESORPTIVITY OF ORGANIC COMPOUNDS IN SAND AND GRAVEL IS ≈.5
• CONTINUOUS AVERAGE PUMPING VALUE
SMITH SCHOOL
HAVILAND APARTMENT COMPLEX
CAR WASH
HAVILAND JUNIOR H.S.
HAVILAND SHOPPING COMPLEX
HAVILAND
WRIGHT
ROUTE 9G
SUNSET
FALL KILL
N
SCALE: 1"=250'
GROUNDWATER FLOW PATH
19.5
3.6
6.7
7.0
17.0
96.6
HOLZMACHER, McLENDON & MURRELL, P.C.
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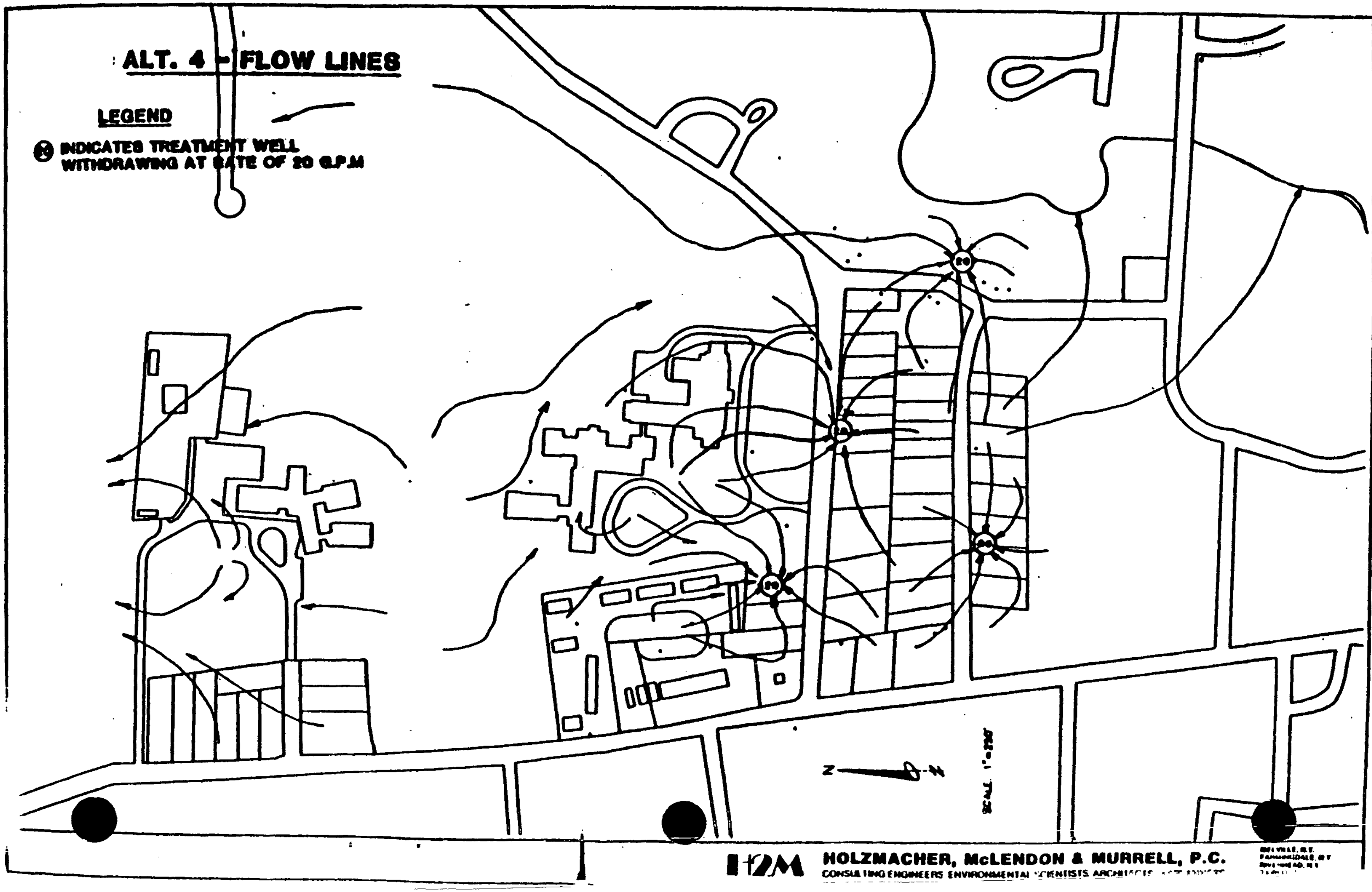
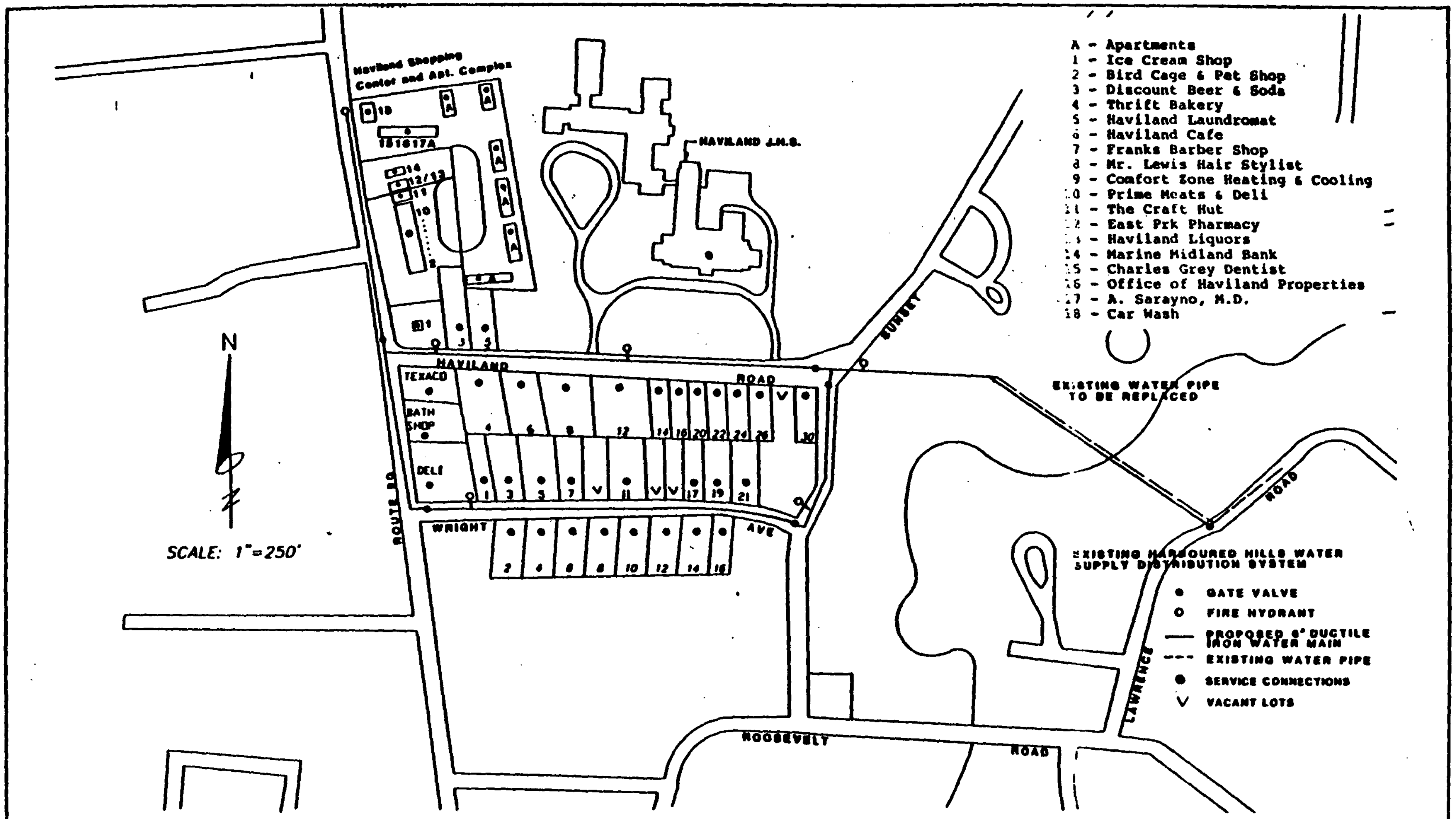

ALT. 4 - FLOW LINES
LEGEND
INDICATES TREATMENT WELL WITHDRAWING AT RATE OF 20 G.P.M
HOLZMACHER, McLENDON & MURRELL, P.C.

Figure 9



PROPOSED DISTRIBUTION SYSTEM TO EXTEND HARBOURED HILLS
COMMUNITY WATER SUPPLY TO THE HAVILAND COMPLEX WELLS SITE

H2M HOLZMACHER, McLENDON & MURRELL, P.C.
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Figure 10

Figure 11

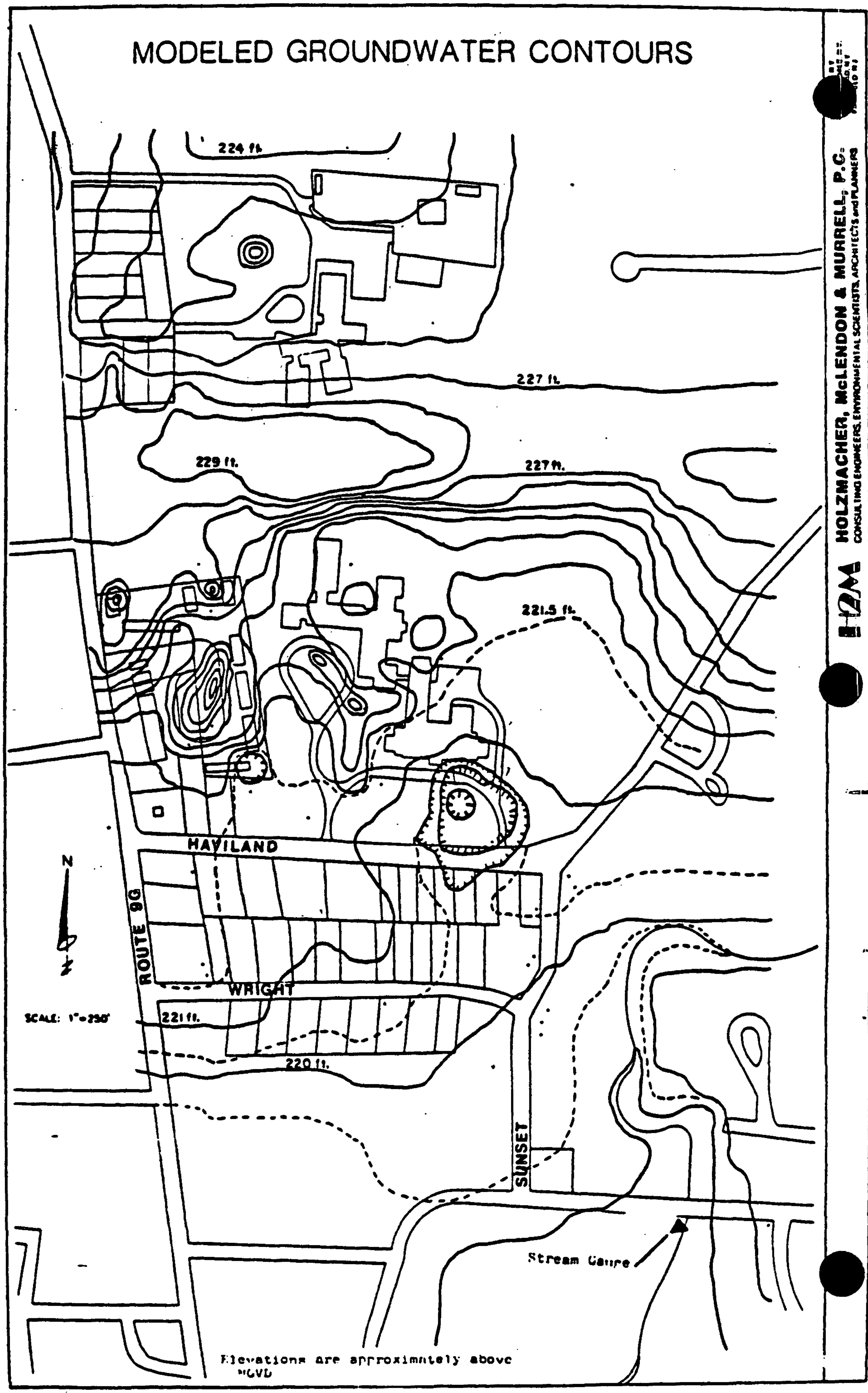
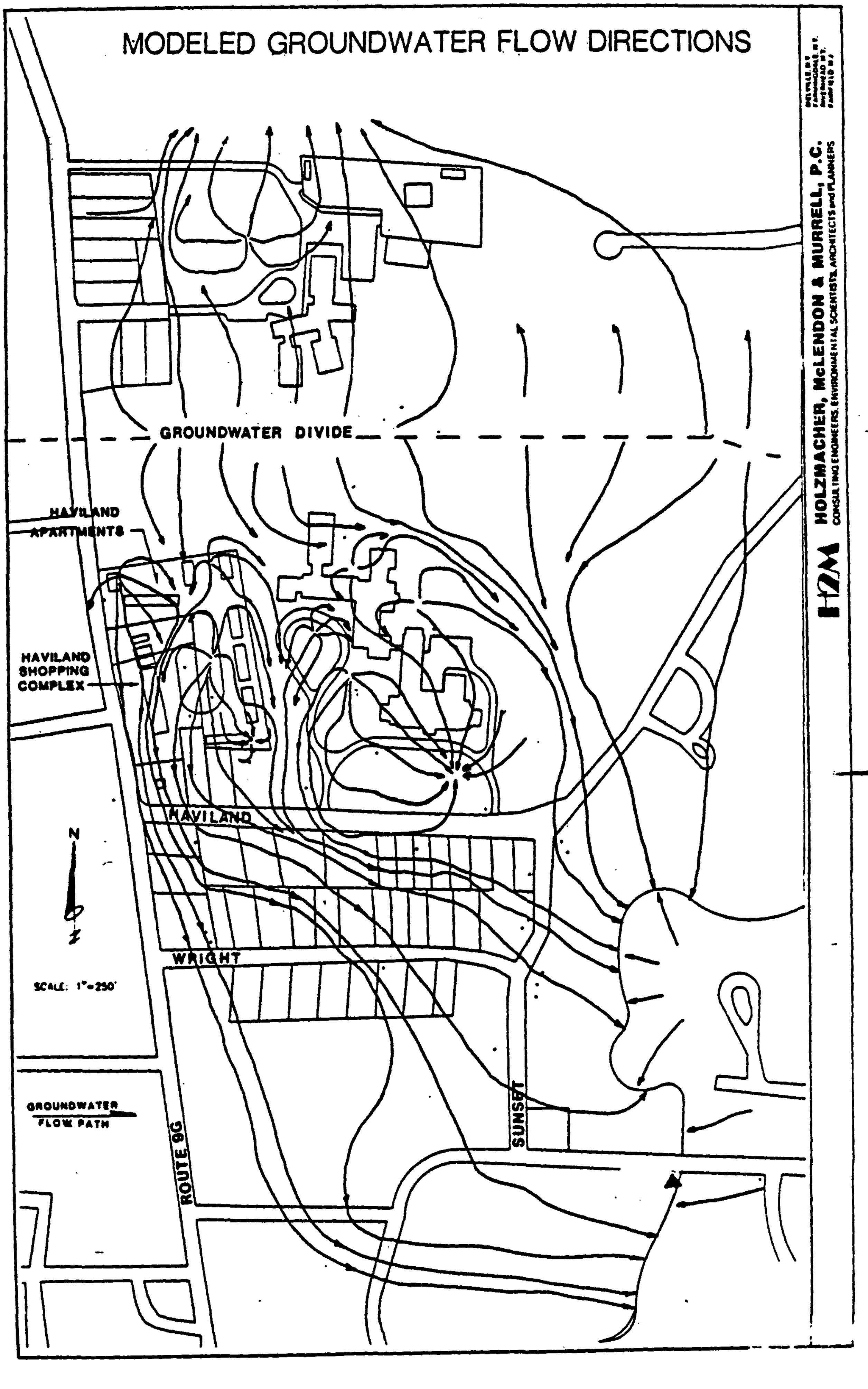

MODELED GROUNDWATER CONTOURS
224 ft
227 ft.
229 ft.
227 ft.
221.5 ft.
HAVILAND
ROUTE 9G
WRIGHT
221 ft.
220 ft.
SUNSET
N
SCALE: 1"=250'
Stream Gauge
Elevations are approximately above NGVD
HOLZMACHER, McLENDON & MURRELL, P.C.
CONSULTING ENGINEERS, ENVIRONMENTAL SCIENTISTS, ARCHITECTS and PLANNERS

Figure 12


MODELED GROUNDWATER FLOW DIRECTIONS
GROUNDWATER DIVIDE
HAVILAND APARTMENTS
HAVILAND SHOPPING COMPLEX
HAVILAND
WRIGHT
SUNSET
ROUTE 9G
N
SCALE: 1"=250'
GROUNDWATER FLOW PATH
H2M
HOLZMACHER, McLENDON & MURRELL, P.C.
CONSULTING ENGINEERS, ENVIRONMENTAL SCIENTISTS, ARCHITECTS and PLANNERS

INORGANIC WATER QUALITY RESULTS FOR ROUNDS ONE AND TWO SHALLOW WELLS

N - SPIKE RECOVERY LESS THAN 75%
S - ALTERNATE MSA PROCEDURE WAS USED
+E - SUSPECTED INTERFERNCES
* - INTERFERNCES DUE TO PARTICULATES
ND - LESS THAN DETECTION

SAMPLING LOCATION	29-s	26-s	27-s	28-s	25-s	24-s	18-s	22-s	19-s	20-s	23-s	21-s	16-s
DETERGENT	ND	ND	0.18	ND	0.06	ND	ND	ND	0.05	1.3	0.66	ND	ND
(MBAS)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.23	0.25	ND	ND
CHLORIDE	45	53	71	119	162	72	232	132	176	300	195	28	85
(mg/l)	195	56	320	230	134	72	248	82	192	340	200	34	36
PHENOLS	1.2	ND	ND	ND	ND	1.2	ND	ND	3.6	21	ND	ND	ND
(ug/l)	1.2	ND	ND	ND	2	ND	3.2	ND	ND	20	2.8	ND	ND
NO3 & NO2	ND	5.7	0.1	ND	2.4	19	12.7	2.7	0.2	ND	ND	10.6	3
(mg/l)	0.3	6.9	ND	0.2	0.2	10.5	11.6	3.3	0.8	ND	0.3	10.7	5.9
CYANIDE	ND	ND	ND	ND	ND	ND	25	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ANTIMONY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	77	68	563	246	104	ND	218	NE 90	NE 28.4	NE 122	NE 98	72	NE 357
ARSENIC	ND	NS 47.7	ND	N 11.8	ND	18.8	NE 500	30	NS 42.2	N 23.5	NE 23.5	NE 21.8	110
(ug/l)	ND	S 56	ND	72.5	SNE 21.7	ND	NE ND	26.5	135	28	S 29.3	*S 88	* 148
BERYLIUM	ND	ND	ND	ND	20	ND	ND	ND	ND	ND	ND	ND	N ND
(ug/l)	ND	ND	17	ND	ND	ND	ND	ND	13	ND	ND	ND	18
CADMIUM	ND	ND	ND	ND	10	ND	30	ND	ND	9	ND	ND	12
(ug/l)	NE 12	17	NE 182	86	NE 22	ND	NE 97	NE 18	NE 130	NE 22	NE 22	37	NE 172
CHROMIUM	60	70	140	130	110	30	N 330	40	N 60	N 110	N 40	N 50	450
(ug/l)	62	164	563	328	487	22	369	384	340	34	37	81	398
COPPER	430	220	510	380	310	80	600	80	100	280	160	150	1210
(ug/l)	NE 270	268	NE 1130	614	154	31	420	NE 63	NE 725	NE 93	NE 120	302	NE 1140
LEAD	350	170	500	450	320	27.8	470	110	250	250	150	130	820
(ug/l)	250	180	670	350	150	18	350	100	690	120	140	200	810
MERCURY	1.1	0.4	1	1.4	1.4	ND	1.6	ND	0.4	0.7	0.5	0.3	2.3
(ug/l)	NE 0.6	0.8	NE 1.8	1.2	ND	ND	1.2	ND	1.2	* 0.5	0.7	0.4	2.3
NICKEL	180	N 80	200	N 140	180	ND	350	50	60	160	60	120	690
(ug/l)	102	182	547	216	NE 97	ND	NE 197	87	311	ND	ND	138	610
SELENIUM	N ND	N ND	N ND	N+E 73.5	24	+ 4	N ND	ND	N ND	N ND	N ND	N ND	N ND
(ug/l)	+E 410	ND	ND	+E 43.5	+E ND	ND	ND	NE ND	NE ND	NE ND	NE ND	S 8.1	NE ND
SILVER	ND	ND	ND	ND	ND	ND	N ND	ND	N ND	N ND	N ND	N ND	ND
(ug/l)	NE ND	NE ND	NE ND	NE ND	NE ND	NE ND	N ND	NE ND	NE ND	NE 302	NE ND	NE ND	NE ND
THALLIUM	N ND	N ND	N ND	N ND	N ND	N ND	N ND	N ND	N ND	N ND	N ND	N ND	N ND
(ug/l)	NE ND	NE ND	NE ND	NE ND	NE ND	NE ND	ND	NE ND	NE ND	NE ND	NE ND	NE ND	NE ND
ZINC	610	N 360	880	N 530	500	120	NE 1390	140	300	490	230	240	2400
(mg/l)	NE 415	456	NE 2200	1100	NE 253	93	844	NE 148	NE 1520	NE 454	NE 231	576	NE 2010
pH	6.5	7.6	6.2	6.5	7	7.1	6.6	7.1	6.7	7.2	7.1	7.5	7.5
	6.5	7.5	6.2	6.3	7	7.1	6.5	6.9	6.7	7.2	.7	7.5	7.5

For each water quality parameter: Round I is the first line; Round II is the second line.

HOLZMACHER, McLENDON & MURRELL, P.C.
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Table 1

INORGANIC WATER QUALITY RESULTS FOR ROUNDS ONE AND TWO DEEP AND BEDROCK WELLS

N - SPIKE RECOVERY LESS THAN 75%
S - ALTERNATE MSA PROCEDURE WAS USED
+E - SUSPECTED INTERFERNCES
* - INTERFERNCES DUE TO PARTICULATES
ND - LESS THAN DETECTION

SAMPLING LOCATION	29-D	29-DD	26-D	27-D	27-B	28-D	25-D	DRY WELL
DETERGENT	ND	ND	ND	ND	0.09	ND	ND	1.15
(MBAS)	ND	ND	ND	ND	ND	ND	ND	0.46
CHLORIDE	38	65	14	39	42	33	143	3350
(mg/l)	36	68	16	41	40	37	150	1770
PHENOLS	ND	ND	ND	ND	1.2	ND	ND	ND
(ug/l)	ND	ND	ND	ND	2	ND	2.4	4.4
NO3 & NO2	3.2	1	0.1	4.5	1.8	ND	ND	0.3
(mg/l)	3.2	3.2	0.7	4.7	0.2	0.2	ND	ND
CYANIDE	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND
ANTIMONY	ND	ND	ND	ND	ND	ND	ND	371
(ug/l)	ND	ND	ND	ND	ND	ND	ND	94
ARSENIC	13.8	ND	N 10	N 11	ND	N 100	ND	248.3
(ug/l)	ND	ND	ND	ND	ND	16.8	NE 9	NE ND
BERYLIUM	21	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND
CADMIUM	ND	ND	ND	ND	ND	ND	ND	67
(ug/l)	NE ND	NE ND	ND	NE ND	NE ND	NE ND	NE 7	NE 17
CHROMIUM	20	ND	20	20	ND	100	ND	130
(ug/l)	ND	ND	14	13	21	18	56	25
COPPER	60	ND	ND	40	ND	ND	180	350
(ug/l)	NE 119	NE ND	ND	NE ND	NE ND	NE 81	ND	132
LEAD	14	ND	ND	13	ND	120	ND	1222
(ug/l)	ND	ND	9.5	5	5	100	7	300
MERCURY	ND	ND	ND	0.3	0.4	ND	ND	0.4
(ug/l)	NE* 3.6	NE ND	1	NE 0.3	NE ND	NE 0.2	1.3	ND
NICKEL	ND	ND	N ND	N ND	ND	N 90	ND	230
(ug/l)	ND	ND	ND	ND	ND	ND	NE ND	NE ND
SELENIUM	N ND	N ND	N ND	N ND	N ND	N ND	11	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND
SILVER	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	NE ND	NE ND	NE ND	NE ND	NE ND	NE ND	NE ND	NE ND
THALIUM	N ND	N ND	N ND	N ND	N ND	N ND	N ND	N ND
(ug/l)	NE ND	NE ND	NE ND	NE ND	NE ND	NE ND	NE ND	NE ND
ZINC	80	30	N 30	N 50	150	270	ND	3450
(mg/l)	NE 69	NE ND	43	NE 44	NE 65	NE 148	NE 51	NE 552
pH	7.4	7.6	8.1	7.6	9.8	7.1	8.7	7.5
	7.6	7.6	8.1	7.7	9.5	7.1	9	7.4

For each water quality parameter: Round I is the first line; Round II is the second line.

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MELVILLE, N.Y. FARMINGDALE, N.Y. RIVERHEAD, N.Y. FAIRFIELD, N.J.

Table 2

SIGNIFICANT VOLATILE ORGANIC WATER QUALITY RESULTS FOR ROUNDS ONE AND TWO
SHALLOW WELLS

B - CORRECTED FOR BLANK CONTAMINATION
ND - LESS THAN DETECTION

SAMPLING LOCATION	29-s	26-s	27-s	28-s	25-s	24-s	18-s	22-s	19-s	20-s	23-s	21-s	16-s
1,1-DICHLORO	ND	ND	B 17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHENE (ug/l)	ND	11	B .11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLORO	ND	ND	ND	ND	ND	JB 23	ND	ND	ND	ND	13	ND	ND
ETHENE (ug/l)	ND	ND	ND	ND	ND	B 25	ND	ND	ND	ND	B 8	ND	ND
1,1,1-TRICHLORO	B 7	ND	B 28	B 6	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHANE (ug/l)	ND	B 21	B 104	B 10	B 12	B 9	ND	B 12	B 12	ND	ND	B 17	ND
ACETONE	ND	ND	16	ND	ND	ND	ND	ND	ND	29	ND	12	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	B 6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	B 12	B 5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOLUENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND	ND	B 11	ND	ND	ND
METHYLENE	ND	ND	B 5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLORIDE (ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBON DISULFIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL XYLENES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLORO BENZENE	ND	ND	ND	ND	ND	ND	8	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	B 15	ND	ND	ND	ND	ND	ND
2-BUTANONE	ND	ND	ND	ND	ND	ND	ND	ND	ND	B 6	ND	ND	ND
(ug/l)	ND	ND	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLORO	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHENE (ug/l)	ND	ND	ND	ND	8	ND	ND	ND	ND	ND	ND	ND	ND

For each water quality parameter: Round I is the first line; Round II is the second line.

Table 3

SIGNIFICANT VOLATILE ORGANIC GROUND WATER QUALITY RESULTS FOR ROUNDS ONE AND TWO DEEP AND BEDROCK WELLS

B - CORRECTED FOR BLANK CONTAMINATION
ND - LESS THAN DETECTION

SAMPLING LOCATION	29-D	29-DD	26-D	27-D	27-B	28-D	25-B	DRY WELL
1,1-DICHLORO	ND	ND	ND	ND	B 46	ND	ND	ND
ETHENE (ug/l)	ND	ND	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLORO	6	ND	ND	ND	22	ND	ND	ND
ETHENE (ug/l)	9	ND	ND	ND	ND	ND	ND	ND
1,1,1-TRICHLORO	ND	B 13	ND	B 8	B 52	ND	ND	ND
ETHANE (ug/l)	ND	ND	B 7	ND	ND	ND	ND	ND
ACETONE	ND	ND	ND	ND	ND	ND	ND	35
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	B 27	ND	ND	ND	ND	ND
TOLUENE	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND
METHYLENE	ND	ND	ND	ND	ND	ND	ND	ND
CHLORIDE (ug/l	ND	ND	B 5	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	ND	B 5	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND
CARBON DISULFIDE	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	17
TOTAL XYLENES	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	19
CHLORO BENZENE	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND
2-BUTANONE	ND	ND	ND	ND	ND	ND	ND	ND
(ug/l)	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLORO	ND	ND	ND	ND	ND	ND	ND	ND
ETHENE (ug/l)	ND	ND	ND	ND	ND	ND	ND	ND

For each water quality parameter:
Round I is the first line; Round II is the second line

H2M **HOLZMACHER, McLENDON & MURRELL, P.C.**
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RIVERHEAD, N.Y.
FAIRFIELD, N.J.

TABLE 5

INORGANIC WATER QUALITY RESULTS FOR ROUNDS ONE AND TWO -FALL KILL

N - SPIKE RECOVERY LESS THAN 75%
S - ALTERNATE MSA PROCEDURE WAS USED
+E - SUSPECTED INTERFERNCES
* - INTERFERNCES DUE TO PARTICULATES
ND - LESS THAN DETECTION

SAMPLING LOCATION		PT-1		PT-2		PT-3		PT-3A		PT-4		PT-5
DETERGENT		ND		ND		ND				ND		ND
(MBAS)		ND		ND				ND		ND		ND
CHLORIDE		30		44		43				30		32
(mg/l)		19		20				23		21		21
PHENOLS		ND		1.2		ND				ND		ND
(ug/l)		ND		2				ND		2.4		0.5
NO3 & NO2		0.7		0.6		0.6				0.7		0.7
(mg/l)		0.7		0.7				0.8		0.8		0.8
CYANIDE		ND		ND		ND				ND		ND
(ug/l)		ND		ND				ND		ND		ND
ANTIMONY		ND		ND		ND				ND		ND
(ug/l)		78		ND				ND		ND		ND
ARSENIC		ND		ND		ND				ND		ND
(ug/l)		ND		ND				ND		ND		ND
BERYLIUM	N	ND	N	ND	N	ND			N	ND	N	ND
(ug/l)		ND		ND				ND		ND		ND
CADMIUM		ND		ND		ND				ND		ND
(ug/l)		6		ND				7		ND		5
CHROMIUM		ND		ND		ND				ND		ND
(ug/l)		ND		ND				ND		ND		ND
COPPER		ND		ND		ND				ND		ND
(ug/l)		ND		ND				30		ND		25
LEAD		ND		7		ND				ND		ND
(ug/l)		ND		ND				15.6		ND		ND
MERCURY		ND		ND		ND				ND		ND
(ug/l)		ND		ND				ND		ND		0.4
NICKEL		ND		ND		ND				ND		ND
(ug/l)		ND		ND				ND		ND		ND
SELENIUM	N	ND	N	ND	N	ND			N	ND	N	ND
(ug/l)		ND		ND				ND		ND		ND
SILVER		ND		ND		ND				ND		ND
(ug/l)	NE	10	NE	10			NE	16	NE	10	NE	ND
THALIUM	N	ND	N	ND	N	ND			N	ND	N	ND
(ug/l)	NE	10	NE	10			NE	ND	NE	ND	NE	ND
ZINC		ND		40		50				ND		ND
(mg/l)		ND		ND				56		ND		ND
pH		7.4		7.3		7.5				7.1		7.3
		7.2		7.1				7		7.1		7.1

For each water quality parameter: Round I is the first line; Round II is the second line.

TABLE 6

ORGANIC ANALYSIS (ug/l)

SEPTIC SYSTEM SAMPLING

HAVILAND COMPLEX WELLS SITE

Compound	S-1	S-2	S-3	S-4	S-5	S-6	S-7
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	4 JB	6 B	1 JB	2 B	4 JB	3 JB	3 JB
Acetone	73	10 U	26	72	9 J	14	11
Carbon Disulfate	6	2 JB	13 B	2 B	14	15	12
1,1-Dichloroethene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trans-1,2-Dichloroethene	5 U	1 J	5 U	5 U	5 U	5 U	5 U
Chloroform	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,1-Trichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl Acetate	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trans-1,3-Dichloropropene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Benzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cis-1,3-Dichloropropene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Chloroethylvinylether	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	5 U	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	41 B	44 B	170 B	340 B	92 B	340 B	270 B
Chlorobenzene	5 U	1 JB	23 B	2 JB	1 JB	1 JB	5 U
Ethylbenzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Styrene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Total Xylenes	5 U	5 U	5 U	5 U	5 U	3	5 U
Dichlorobenzene	20 U	10 U	11	20 U	20 U	50 U	10 U

U - undetected   J - incomplete recovery   B - found in blank

TABLE 6 CONT'D

ORGANIC ANALYSIS (ug/l) (CONT'D.)

SEPTIC SYSTEM SAMPLING

HAVILAND COMPLEX WELLS SITE

Compound	S-8	S-9	S-10	S-11	S-12	S-13	S-14
Chloromethane	10 U	500 U	10 U	5 J	5 J	5 J	5 J
Bromomethane	10 U	500 U	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10 U	500 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	500 U	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	4 JB	130 JB	2 JB	3 JB	2 JB	2 JB	2 JB
Acetone	38	900 B	13 B	97 B	14 B	610 B	120 B
Carbon Disulfate	11	200 JB	2 JB	26 B	20 B	38 B	40 B
1,1-Dichloroethene	5 U	250 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5 U	250 U	5 U	5 U	5 U	5 U	5 U
Trans-1,2-Dichloroethene	25	250 U	5 U	5 U	5 U	5 U	5 U
Chloroform	1 J	250 U	5 U	2 J	5 U	5 U	5 U
1,2-Dichloroethane	5 U	250 U	5 U	5 U	5 U	5 U	5 U
2-Butanone	10 U	500 U	10 U	10 U	10 U	460	10 U
1,1,1-Trichloroethane	5 U	250 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	5 U	250 U	5 U	5 U	5 U	5 U	5 [illegible]
Vinyl Acetate	10 U	250 U	10 U	10 U	10 U	9 J	10 [illegible]
Bromodichloromethane	5 U	250 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5 U	250 U	5 U	5 U	5 U	5 U	5 U
Trans-1,3-Dichloropropene	5 U	250 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene		250 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	5 U	250 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5 U	250 U	5 U	5 U	5 U	5 U	5 U
Benzene	5 U	510 B	11 B	11 B	8 B	9 B	8 B
Cis-1,3-Dichloropropene	5 U	250 U	5 U	5 U	5 U	5 U	5 U
2-Chloroethylvinylether	10 U	250 U	10 U	10 U	10 U	10 U	10 U
Bromoform	5 U	250 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-Pentanone	10 U	250 U	10 U	10 U	10 U	6 JB	10 U
2-Hexanone	10 U	250 U	10 U	10 U	10 U	810	21
Tetrachloroethene	6	250 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5 U	250 U	5 U	5 U	5 U	5 U	5 U
Toluene	120 B	77 JB	3 JB	46 B	2 JB	1900 B	7 B
Chlorobenzene	5 U	250 U	2 J	15 B	5 U	5 U	5 U
Ethylbenzene	6	250 U	5 U	5 U	5 U	3 J	16
Styrene	5 U	250 U	5 U	5 U	5 U	5 U	5 U
Total Xylenes	63	250 U	2 B	4 B	5 U	10 B	92 B
Dichlorobenzene	400 U	20 U	20 U	31	20 U	10 U	10 U

U - undetected J - incomplete recovery B - found in blank

TABLE 7

INORGANIC ANALYSIS (ug/l)

SEPTIC SYSTEM SAMPLING

HAVILAND COMPLEX WELLS SITE

Parameter	S-1	S-2	S-3	S-4	S-5	S-6	S-7	Federal MCLs	NYS Class GA Groundwater Discharge Standards
Detergent (MBAS)	1#	0.73#	1.66#	1.76#	1.83#	2.08#	1.2#	—	—
Chloride	220#	230#	260#	230#	240#	230#	240#	—	—
Phenols	21	16	124	120	46	76	86	—	2
NO2-N + NO3-N	<0.1#	<0.1#	<0.1#	<0.1#	<0.1#	<0.1#	<0.1#	—	10
Cyanide	27	12	42	14	20	42	23	—	—
Antimony	<60	<60	<60	68	76	90	62	—	—
Arsenic	<10 NE	<10 NE	<10 NE	<10 NE	<10 NE	29.7 NE	<10 NE	50	50
Beryllium	<5	16	8	<5	5	<5	<5	—	—
Cadmium	20	33	10	<5	<5	25	<5	10	20
Chromium	24	34	16	<10	14	67	<10	—0	—
Copper	2570	2750	291	310	209	8870	172	50	100
Lead	110	<5	<5	<5	<5	430	<5	—	1000
Mercury	330 NE	0.2 NE	0.2 NE	0.3 NE	0.2 NE	0.2 NE	<0.2 NE	50	50
Nickel	71	<40	<40	<40	<40	146	<40	2	4
Selenium	<5 NE	<5 NE	<5 NE	<5 NE	<5 NE	14 NE	<5 NE	—	—
Silver	102	<10	<10	<10	<10	<10	10	10	40
Thallium	<10 NE	<10 NE	<100 NE	<100 NE	<10 NE	<100 NE	<100 NE	50	100
Zinc	2550	356	644	154	146	6310	115	—	5000

All results are in ug/l except when denoted by "#" (mg/l)

N - Spike recovery not within control limits
E - Estimated value due to interference

TABLE 7 (CONT'D)

INORGANIC ANALYSIS (ug/l) (CONT'D.)

SEPTIC SYSTEM SAMPLING

HAVILAND COMPLEX WELLS SITE

Parameter	S-8	S-9	S-10	S-11	S-12	S-13	S-14	Federal MCLs	NYS Class GA Groundwater Discharge Standards
Detergent (MBAS)	1.6#	0.38#	<0.04#	0.34#	<0.04#	2.24#	<0.04#	—	—
Chloride	230#	210#	<2#	108#	15#	99#	1180#	—	—
Phenols	20	15	<1	59	4	74	<1	—	2
NO2-N + NO3-N	<0.1#	1.9#	1.9#	<0.1#	<0.1#	<0.1#	<0.1#	—	10
Cyanide	70	173	<10	27	<10	20	<10	—	—
Antimony	172	64	<60	<60	<60	<60	130	—	
Arsenic	<200 NE	<10 NE	<10 NE	<10 NE	<10 NE	<10 NE	<200 NE	50	50
Beryllium	<5	<5	<5	<5	<5	<5	<5	—	—
Cadmium	66	<5	<5	<5	<5	5	97	10	20
Chromium	328	21	11	<10	<10	25	216	—	—
Copper	10600	80	1410	62	69	434	723	50	100
Lead	1840	270	270	<50	<50	140	1400	—	1000
Mercury	38 NE	0.6 NE	<0.2 NE	0.2 NE	0.6 NE	1.0 NE	0.6 NE	50	50
Nickel	198	<40	<40	<40	<40	50	299	2	4
Selenium	<100 NE	<5 NE	<5 NE	<5 NE	<5 NE	<5 NE	<100 NE	—	—
Silver	12	16	<10	<10	<10	12	<10	10	40
Thallium	<10 NE	<100 NE	<10 NE	<100 NE	<10 NE	<10 NE	<10 NE	50	100
Zinc	12700	281	356	99	120	985	3710	—	5000

All results are in ug/l except when denoted by "#" (mg/l)

N - Spike recovery not within control limits
E - Estimated value due to interference

TABLE 8 SUMMARY OF ESTIMATED COSTS FOR IMPLEMENTATION OF HAVILAND COMPLEX WELLS SITE REMEDIAL ACTION ALTERNATIVES

ALTERNATIVE	CAPITAL COST	ANNUAL O&M	TOTAL PRESENT WORTH	NO. OF YEARS OF REMEDIAL ACTION IMPLEMENTATION
NO.1 - NO ACTION	- 0 -	- 0 -	- 0 -	N/A
NO.2 - SOURCE CONTROL	98,000	- 0 -	98,000	0
NO.4 - GROUNDWATER EXTRACTION, TREATMENT AND DISCHARGE TO SURFACE WATERS				
A - METALS REMOVAL ONLY	273,000	47,000	561,800	10
B - AIR STRIPPING ONLY	170,000	19,500	289,800	10
C - GRANULAR ACTIVATED CARBON ONLY	175,000	44,000	445,400	10
A+B ** - METALS REMOVAL AND AIR STRIPPING	393,600	66,500	802,200	10
A+C ** - METALS REMOVAL AND GAC	400,600	91,000	959,800	10
NO.5 - GROUNDWATER EXTRACTION, TREATMENT AND DISCHARGE AS A PUBLIC WATER SUPPLY				10 YRS. FOR TREATMENT/ 30 YRS. FOR PUBLIC WATER SERVICE
A - METALS REMOVAL ONLY	661,200	86,000	1,317,700	10 / 30
B - AIR STRIPPING ONLY	558,200	58,500	1,045,700	10 / 30
C - GAC ONLY	563,200	83,000	1,201,300	10 / 30
A+B ** - METALS REMOVAL AND AIR STRIPPING	781,800	105,000	1,558,100	10 / 30
A+C ** - METALS REMOVAL AND GAC	788,800	130,000	1,715,700	10 / 30
NO.10 ** - PROVIDE PUBLIC WATER SUPPLY TO ALL PRIVATE WELL USERS WITHIN THE STUDY AREA	765,900	39,000	1,133,600	30

** - INCLUDE MISC. AND CONTINGENCY COSTS

TABLE 9

SUMMARY OF SELECTED REMEDY AND COSTS

Recommended Remedial Action Plan No. IV	Capital Cost ($)	Operation & Maintenance Costs ($/yr)	Number of Years of Implementation	Present Worth ($)
No.2 Source Control	$ 98,000	$ -0-	-	$ 98,000
No.4 A Groundwater Extraction, Treatment (metals removal and air stripping) and discharge to Surface Water	393,600	66,500	10	802,200
No.10 Provide Public Water Supply to all private well users within the study area	765,900	39,000	30	1,133,600
TOTAL	$1,257,500	$105,500		$2,033,800

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

EPA-REGION II
OFFICE OF EMERGENCY &
REMEDIAL RESPONSE

1987 SEP 16 PM 12:20

Thomas C. Jorling
Commissioner

McCabe

TELEX

DIRECTOR'S OFFICE
SEP 11 1987

Mr. Stephen D. Luftig
Director
Office of Emergency and Remedial Response
U. S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, NY 10278

Dear ~~Mr. Luftig~~ Steve:

Re: Haviland Complex Wells Site
Hyde Park (T), Dutchess County
Remedial Investigation/Feasibility Study

The New York State Department of Environmental Conservation (NYSDEC) has recently completed a Remedial Investigation/Feasibility Study (RI/FS) at the Haviland Complex Wells Site, Town of Hyde Park, Dutchess County, New York.

This RI/FS work recommended that the following remedial measures be implemented at this site: 1) source control [Alternative No. 2]; 2) groundwater extraction, treatment and discharge to the Fall Kill Creek [Alternative Nos. 4A&B]; and 3) providing public water [Alternative No. 10] by extending the Harbourd Hills Water System to all private well users within the study area. This Department endorses these recommendations.

We understand that: 1) the remedial costs for this project, including the operation and maintenance costs for Alternative Nos. 4A&B for a ten-year period, will be divided 90% federal and 10% State of New York; and 2) that the State of New York will be responsible for assuring the operation and maintenance of Alternative No. 10. We understand that the first year operation and maintenance costs will be eligible for federal funding.

If you have any questions or comments regarding this matter, please contact Mr. Robert Foltin or Mr. Joseph Iannotti, of my staff, at (518) 457-1708.

Sincerely,

Norman H. Nosenchuck, P.E.
Director
Division of Solid and Hazardous Waste

cc: G. Pavlou, USEPA Region II
W. McCabe, USEPA Region II
A. Posner, USEPA Region II

Responsiveness Summary
Haviland Complex Wells Site

Q: Which direction is the ground-water flow in the Haviland area? Will ground water flow in a southwest direction towards Woodfield Avenue once the preferred alternatives are implemented?

A: Ground water is basically flowing in a southeast direction from the Haviland Complex towards the Fall Kill Creek. The ground-water flow pattern could change should an alternate water supply be used. Connection to public water may result in creating local ground-water mounds and migration of the existing contaminant plume into previously unaffected areas to the south and southwest of the site. In order to alleviate the potential of further spreading of contaminants and to provide a means for aquifer rehabilitation, ground-water extraction wells would be installed to pump the contaminated ground water to a treatment system.

Q: Is the water from the Harbourd Hills wells drinkable?

A: The Harbourd Hills water is drinkable but does contain iron and manganese levels slightly above the State Health Department standards. The planned remedial action includes upgrading of the Harbourd Hills treatment system to reduce the iron and manganese levels to a point that would meet the requirements of the State Health Department.

Q: Where are the homeowner sampling results from the August 1986 sampling episode performed by the EPA?

A: The results are contained in the Feasibility Study document and they can also be obtained from the Dutchess County Health Department and/or the USEPA.

Q: Why can't the Hyde Park Village Water System be extended to the Haviland area?

A: The implementation of this district to serve the entire town is at least two to three years in the future according to local officials. If this district is established in the future, then the system at Harbourd Hills could serve as back-up. Upgrading and extension of the Harbourd Hills water system appears to be a more cost-effective alternative than the establishment of the Hyde Park Water District.

Q: Why weren't the homeowner septic tanks tested to find out if they were contaminating the ground water in the area?

A: Because of the relatively insignificant quantity of flow associated with private homeowners, the residential septic tanks were not tested during the study. Due to the insignificant flows associated with the residential septic tanks, in the unlikely event of their failure, the resulting contamination would be captured by the extraction and treatment system selected for implementation. Based on pre-RI/FS testing and the flow volumes involved, the study concentrated on the septic tanks of the Haviland apartment complex, Haviland shopping center and Haviland Junior High School. Therefore, monitoring wells were placed immediately downgradient of those septic systems and samples were taken from those septic tanks. Sampling results, both from the monitoring wells and from the septic tanks, indicate volatile organic and metal contamination.

Q: After reviewing the data generated from the study at this site, is it probable that a determination would be made that the pollution was caused by one or more polluters and that legal remedies would be sought against those people?

A: The data in the remedial investigation and feasibility study documents indicate that contamination has emanated from certain point sources. If the government attorneys and technical people decide that enough evidence exists to identify specific polluters responsible for the contamination at this site, then notice letters will be sent to those individuals requesting action on their part.

Q: How long will it take before construction of the preferred alternatives is initiated?

A: The plan is for the design to be funded in the second quarter of federal fiscal year 1988 which would be January through March 1988. Generally, a year would be allocated to complete the design phase since pilot testing of the proposed ground-water treatment system and further ground-water sampling will need to be done during this phase. If this schedule is adhered to, then the start of construction would be in the beginning of calendar year 1989.

Q: Soap is appearing in my well water and I believe it's coming from the Haviland laundromat. Why can't something be done about it?

A: As a follow-up to the septic tank sampling performed in this study, the Dutchess County Health Department and the

New York State Department of Environmental Conservation will investigate and determine what facilities are violating the New York State ground-water discharge standards. Action will be taken accordingly.