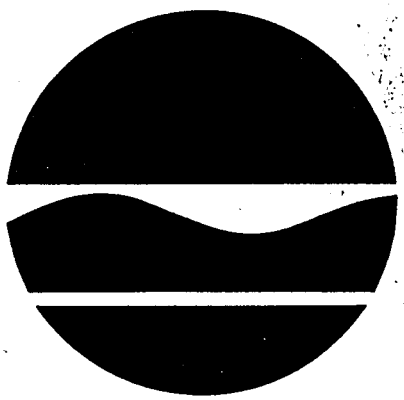
Armonk Private Wells Site

Westchester County, New York
Site Number 3-60-005

New York State Superfund

Record of Decision



March 1990

PREPARED BY:

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
50 Wolf Road, Albany, New York 12233
THOMAS C. JORLING, *Commissioner*

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Armonk Private Well Site, Hamlet of Armonk, Town of North Castle, New York.

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Armonk Private Well Site, developed in accordance with the New York State Environmental Conservation Law (ECL), and is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC Section 9601, et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Appendix A of this record lists the documents that comprise the Administrative Record for the Armonk Site. The documents in the Administrative Record are the basis for the selected remedial action.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, present a current or potential threat to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The major components of the selected remedy can be summarized as follows:

- Removal and off-site treatment of liquid wastes and sludges from septic tank(s) and removal and off-site disposal of septic tank materials.
- Soil/gas collection by vacuum extraction with on-site treatment of extracted gases using carbon adsorption.
- Provision for a municipal water supply. This remedial response is already in progress by USEPA.
- Groundwater restoration by pumping and on-site treatment using carbon adsorption.
- Monitoring of soil/gas, groundwater and the Wampus River pending completion of the remedial objectives.

I. SITE LOCATION AND DESCRIPTION

The Armonk Private Wells Site (AWS) is located in the central business district of the hamlet of Armonk, Town of North Castle, Westchester County. The site is approximately 34 acres in size; bounded by the Wampus River to the east, Bedford Road to the south, Route 128 (Main Street) to the west and the northern end of the A&P Shopping Center to the north and is comprised of approximately 55 private homes and small businesses (Figure 1).

Armonk is not currently serviced by a municipal water supply system. Generally, each household or business obtains water from a private supply well. These wells draw water form the local overburden or bedrock water bearing zones. In some cases, one well services two or more homes/businesses.

II. SITE HISTORY

In 1978, the Westchester County Health Department (WCHD) initiated a study in Westchester County to evaluate groundwater quality in the vicinity of past and present dry cleaning establishments. Water from thirty-six water supply wells at the AWS was sampled and analyzed by WCHD in March 1979. Samples from nine of these wells contained contaminants (halogenated solvents) above New York State Department of Health (NYSDOH) standards. The primary contaminants found were tetrachloroethene (PCE), trichloroethene (TCE) and 1,2-dichloroethene (DCE).

Since the initial WCHD sampling, approximately 68 separate, private and commercial supply wells have been sampled and tested by the WCHD and the United States Environmental Protection Agency Region II Technical Assistance Team (USEPA-TAT). From March 1979 through April 1987 over 350 samples were taken and analyzed. In samples from 37 of the 68 supply wells TCE and PCE were detected with combined concentrations less than 100 parts per billion (ppb) while samples from 13 supply wells indicated combined concentrations of TCE and PCE in excess of 100 ppb, for a specific sampling event. Contaminants were not detected in samples collected from the remaining 18 supply wells.

The majority of the property owners whose supply wells have been affected by the halogenated solvents have been put on "boil water" orders by WCHD or are receiving bottled water from the USEPA-TAT. The USEPA-TAT conducted a study which provides justification for a public water supply system for Armonk. The new water system is expected to be completed the Summer of 1990. The USEPA-TAT study is separate from this NYS Superfund Study, although information collected by the USEPA-TAT and NYS has been exchanged freely.

In addition to the WCHD/USEPA-TAT study, two additional studies were completed. Wehran Engineering, P.C. (Wehran) completed a NYSDEC Phase I Investigation in June 1983 and a NYSDEC Phase II Investigation in June 1985. The Phase I study identified several supply wells as being contaminated with halogenated compounds, and concluded that the situation posed a potential health threat to the population. The Phase II study developed a hazardous ranking system score (HRS) for the AWS of S_m equals 37.9. This HRS score reflects a potential for harm to humans and the environment from groundwater

3. January 30, 1990: At the conclusion of the Feasibility portion of the study, a public meeting was held to present the proposed remedial alternatives for the Armonk Site. Questions and answers recorded during this meeting were used to develop the Responsiveness Summary presented in Appendix B of this document.

IV. CHARACTERISTICS OF THE SITE

The purpose of the Remedial Investigation was to determine the nature, extent and source of contamination and to assess the associated health risks to the public and the environment. To accomplish this for AWS, 18 monitoring wells were installed, and soil and bedrock test borings were completed. Samples of groundwater, surface water, soil and sediments were analyzed and an extensive soil gas survey was conducted.

The geology at the AWS generally consists of a gneissic bedrock overlain by glacial sands. The bedrock, encountered at depths from approximately 10 feet to greater than 125 feet, slopes from the north-northwest to south-southeast. The bedrock is overlain by varying thicknesses of sand containing varying amounts of silt and gravel. The depth to bedrock near the Wampus River is unknown but is greater than 125 feet.

Local groundwater flow in the overburden and bedrock is generally north-west to southeast with an estimated groundwater velocity ranging from 5×10^{-4} to 2 feet per day in the sand overburden and 9×10^{-3} to 2 feet per day in the bedrock. The Wampus River appears to act as a localized groundwater discharge area for the overburden water bearing zone. However, groundwater in the lower overburden and bedrock appears to flow under the Wampus River. Surface water flow at the AWS is generally towards the Wampus River and travels by overland flow and/or the storm sewer system.

Volatile organic compounds (VOCs), particularly PCE, TCE and total 1,2-dichloroethene (DCE), were the primary contaminants found in samples collected at the AWS. However, some groundwater samples tested contained various concentrations of phenols, carbon tetrachloride, priority pollutant metals and other VOCs that exceed established water quality standards. The distribution of the contaminants at the AWS and the known users of these types of chemicals suggests there are three sources: 1) the former 396 Limited Dry Cleaner, currently the Nails Etc. facility located at 400 Main Street; 2) the Country Cleaners Dry Cleaner on Maple Avenue; and 3) Cleaning by Fredericks Dry Cleaners, in the A&P Shopping Center. The source(s) of the other contaminants (i.e. priority pollutant metals, phenols, carbon tetrachloride, and other VOCs) detected in samples during some of the sampling rounds was not determined during this RI study. These contaminants were not detected consistently during the period of study, however, they will be investigated further during the design support testing.

The VOC contamination likely originated as a surface or near-surface release (i.e., the septic systems of the three noted sources). The present distribution of the contaminants is likely the result of a series of hydro-geologic events, including percolation with rainwater, water table fluctuations

and groundwater flow through the overburden and fractured bedrock. VOC contamination has reached the Wampus River, through overland flow, groundwater and/or the storm sewer system. See Figures 2 and 3 for the approximate extent of the groundwater contamination.

Due to the short-term of the RI, the persistence and migration of the contaminants could not be fully evaluated. However, data collected by the WCHD/USEPA-TAT suggest that the contaminants are decreasing in concentration in the supply wells with time. This decrease is likely a result of dispersion and dilution of the contaminants.

V. RISK ASSESSMENT

The two primary exposure routes of concern for the contaminants at the AWS are ingestion and inhalation. Ingestion of contaminants occurs through the use of supply well water for drinking. Inhalation of VOCs occurs by breathing vapors entering the residences through the bathrooms (e.g. taps and showers) and basements (i.e. VOC vapors entering through basement walls from surrounding soils).

The estimated increase in carcinogenic risks from the long term ingestion of TCE and PCE at concentrations measured in samples of groundwater from unfiltered supply wells corresponds to an additional 20 to 39 cancers in the assumed exposed population. (The population within a three mile radius of AWS is 5,900).

Total estimated carcinogenic risks from inhalation of vapors released in the home from unfiltered supply wells correspond to an additional one cancer in the assumed exposed population.

VI. OBJECTIVES AND DEVELOPMENT OF REMEDIAL ALTERNATIVES

The alternatives under consideration for remediation of the Armonk Private Well Site, including the selected alternatives are in compliance with the New York State Environmental Conservation Law (ECL) and are consistent with both Section 105 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the National Contingency Plan (NCP). The goal of the Feasibility Study is to select alternatives which:

1. are protective of human health and the environment
2. attain the response objectives (as outlined in the RI/FS) in a timely manner
3. utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable
4. as a principal element, utilize treatment technologies that reduce toxicity, mobility or volume of the contaminants
5. are cost effective; that is, of the alternatives that are expected to be equally effective and protective of public health and the environment, the least expensive alternative will be given preference

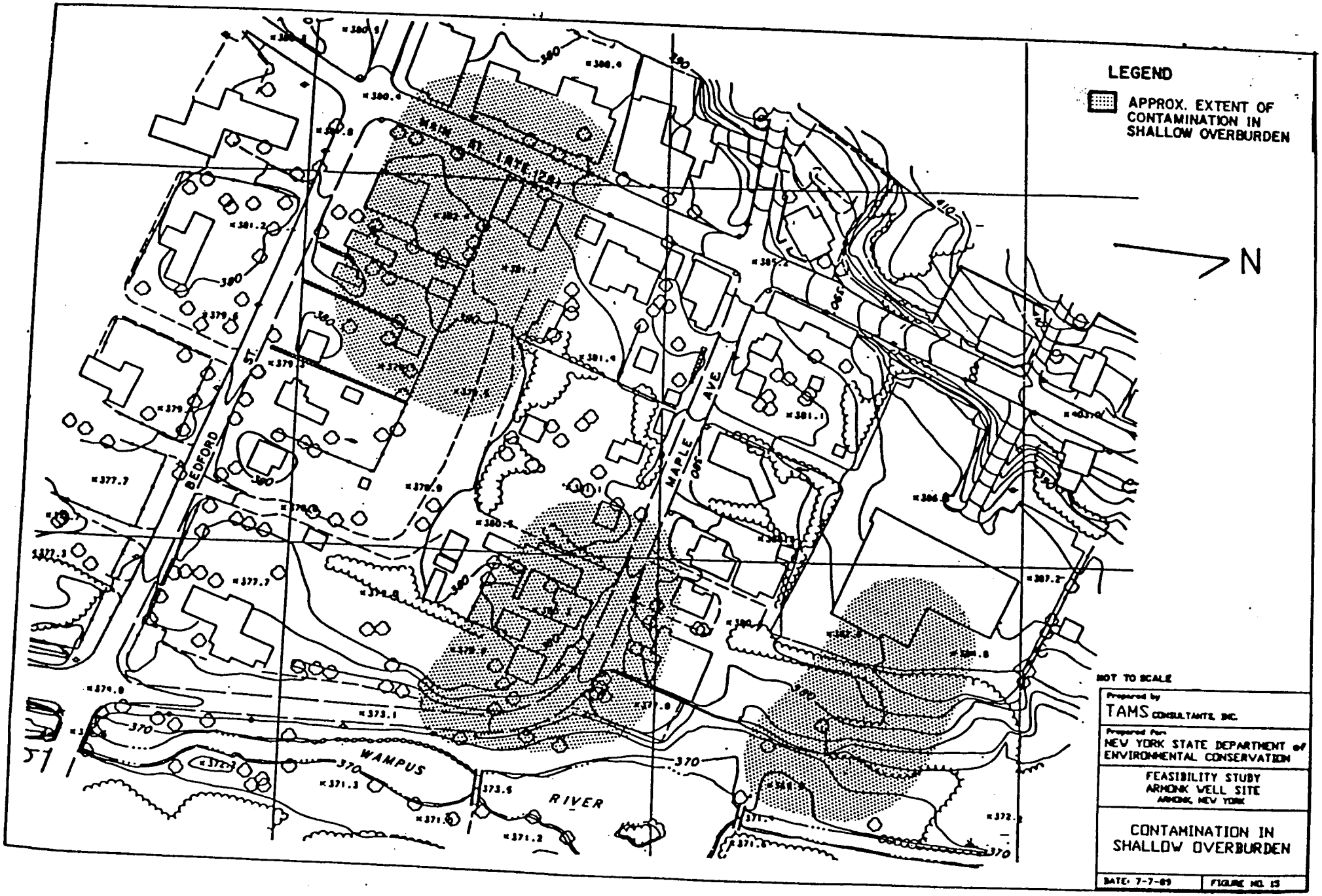


FIGURE 2 - APPROXIMATE EXTENT OF SHALLOW OVERBURDEN CONTAMINATION

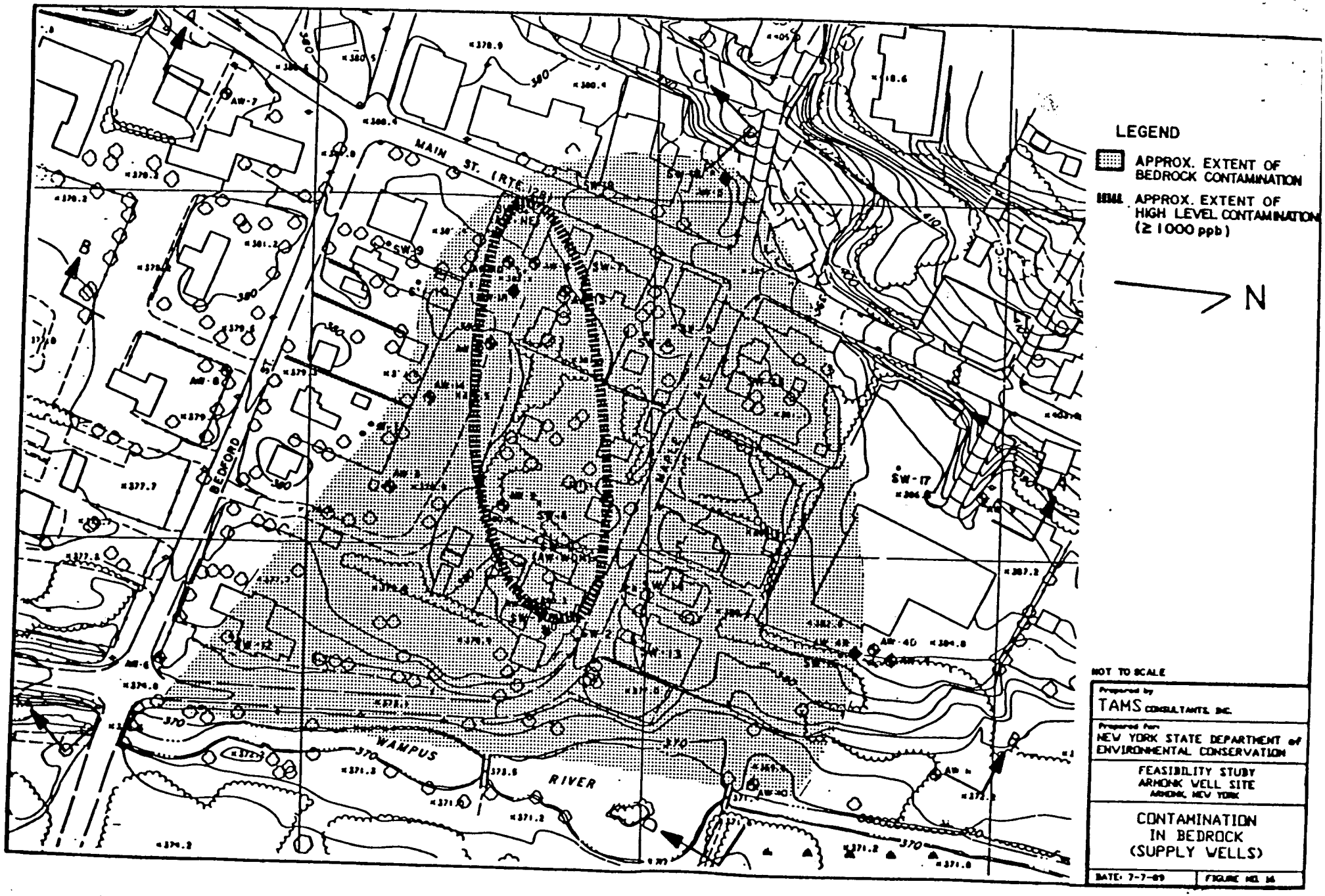


FIGURE 3 - APPROXIMATE EXTENT OF BEDROCK CONTAMINATION

The first step towards this goal is the development of alternatives. For each media or site component requiring remediation, general response actions (such as on- or off-site disposal or treatment) were identified. Next, potential treatment or disposal technologies are screened based on their applicability to the contaminants found and assembled with appropriate process options to identify a number of alternatives.

VII. DESCRIPTION AND EVALUATION OF ALTERNATIVES

The primary contaminants detected at the AWS are tetrachloroethene (perchloroethene or PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (DCE). The sources of contamination were determined to be one former and two existing dry cleaning establishments. Contamination is present in two media requiring remedial action. These have been identified as:

1. Vadose Zone (soil above the water table)
   - Sources (the septic tank(s) and the leachfields).
   - Source Vicinities (contaminated areas immediately adjacent to sources).
2. Groundwater
   - Shallow Saturated Overburden.
   - Bedrock/Deep Saturated Overburden.

A. Discussion of Vadose Zone Alternatives

Eight alternatives (V.1 through V.8) were developed for remediation of the vadose zone. See Figure 4 for a schematic of active gas extraction, and Figure 5 for an estimate of the area requiring treatment.

V.1 - No Action - Consists of periodic monitoring of soil gas and land use restrictions such as prevention of excavation of soil near sources or removal of asphalt surfaces behind Cleaning by Frederick's. It also includes placement of cautionary signs near the sources.

V.2 - Partial source removal/off-site disposal - All of the components of V.1 plus removal of the septic tank(s) and all of its contents and off-site disposal.

V.3 - Partial source removal/off-site disposal/passive gas venting - Similar to V.2 plus passive gas venting, which consists of placing vents in the ground to facilitate volatilization of the contaminants.

V.4 - Partial source removal/off-site disposal/active gas extraction and treatment - Similar to V.2 plus active gas extraction and treatment, which consists of vacuuming the VOC vapors from the soil and treatment of the gases.

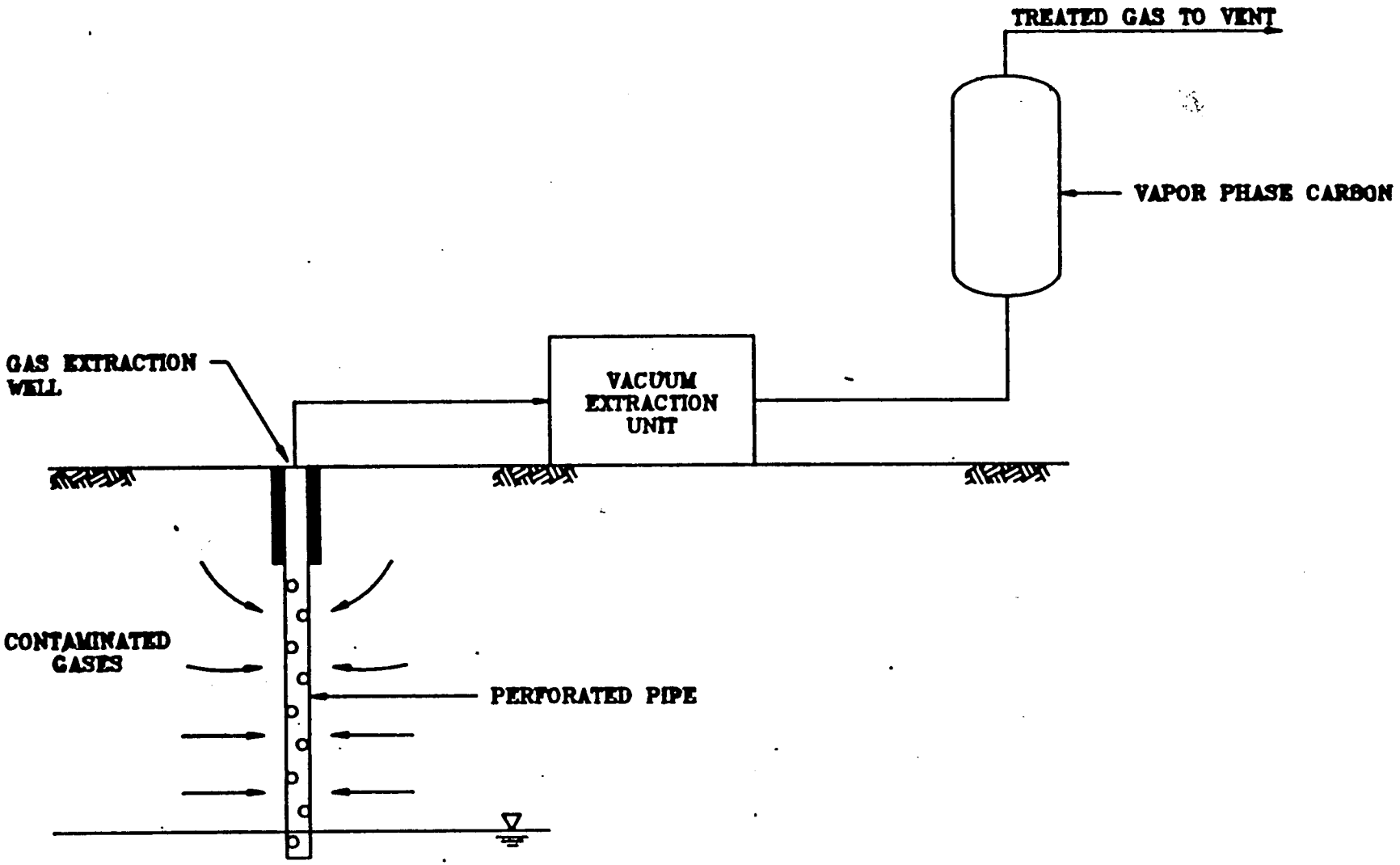


FIGURE 4

SCHEMATIC DIAGRAM OF VACUUM EXTRACTION AND TREATMENT

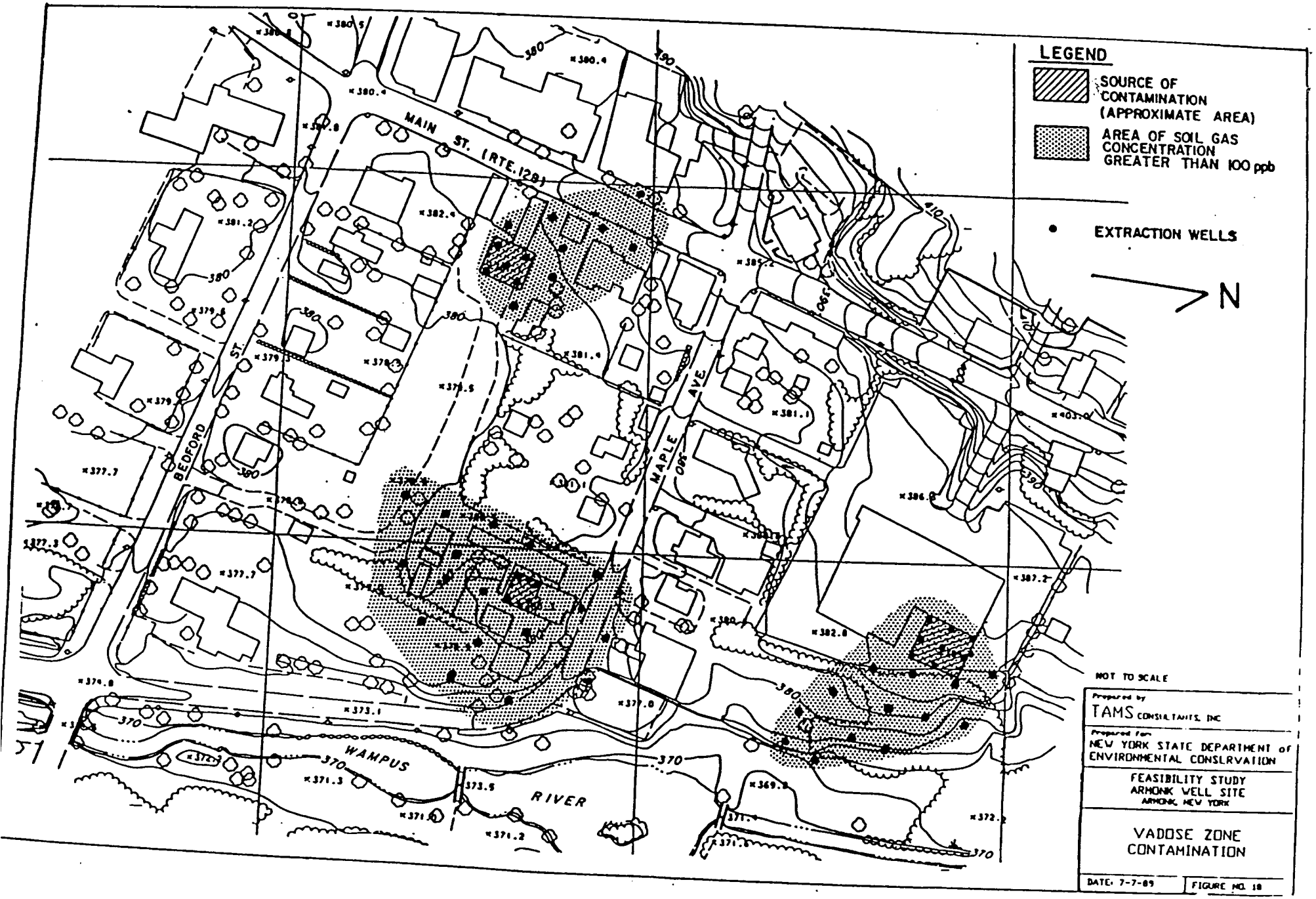


FIGURE 5 - ASSUMED AIR EXTRACITON REMEDIATION SCHEME

V.5 - Full source removal/off-site disposal - Consist of periodic gas monitoring and temporary land use restriction. Removal of the septic tank(s), its contents, contaminated soil immediately surrounding and below the tank, and removal of the pipes and soils from the leachfields.

V.6 - Full source removal/off-site disposal/passive gas venting - Similar to V.5 plus passive gas venting.

V.7 - Full source removal/off-site disposal/active gas collection and treatment Similar to V.5 plus active gas collection and treatment.

V.8 - Full source and source vicinities removal/off-site disposal - Removal of sources and source vicinities (meaning the septic tank and the leachfields, and any contaminated areas immediately adjacent to the sources) with off-site disposal.

Initial screening of these alternatives was based on assessment of effectiveness and the ability to implement the remedy.

While passive gas venting (alternatives V.3 and V.6) is applicable to this site, it would have little effect on contaminants beneath buildings or other features. Also, the rate of removal would be very slow. Alternatives V.3 and V.6 were eliminated from further consideration due to their ineffectiveness.

Although alternative V.8 would be effective in removing contamination from the Armonk site, it involves the excavation of large quantities of soil and disposal at a landfill. This would be in conflict with NYSDEC's objectives of long-term effectiveness and permanence. Also, land burial of the contaminated soils may be banned by new federal regulations which go into effect November 8, 1990. Alternative V.8 was eliminated from further consideration.

B. Discussion of Groundwater Alternatives

Seven alternatives (G.1 through G.7) were developed for remediation of the groundwater. With the exception of the No-Action Alternative, all remedial activities consist of pumping of groundwater using extraction wells and treatment of water, provision for municipal water supply and prohibition of use of private supply wells. The only difference between the alternatives is how and where water treatment takes place and the disposition of the treated groundwater. See Figure 6 for a schematic of the pump and treat system and Figure 7 for assumed well locations.

G.1 - No Action - Periodic sampling and testing of monitoring wells and selected supply wells; sealing or prohibiting the use of private supply wells in downtown Armonk and prohibiting or requiring a special permit for drilling new wells and provisions for a municipal water supply.

G.2 - On-site treatment of extracted groundwater using air stripping in combination with carbon adsorption, discharge of treated water into the Wampus River.

G.3 - Similar to G.2 except treated water would be reinjected into the aquifer.

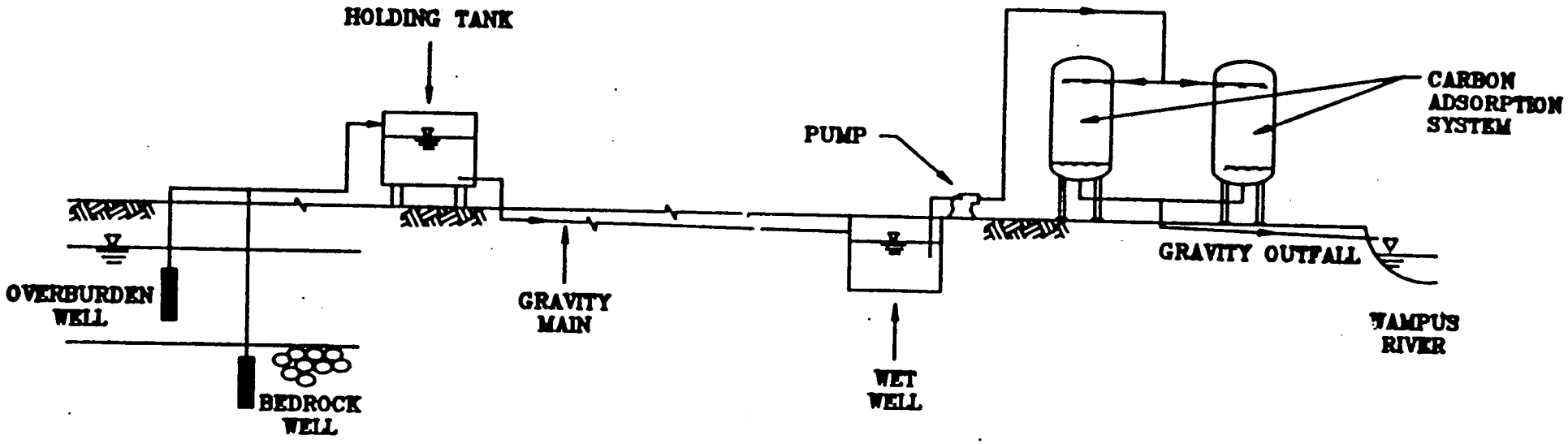


FIGURE 6

SCHEMATIC DIAGRAM OF GROUNDWATER REMEDIATION

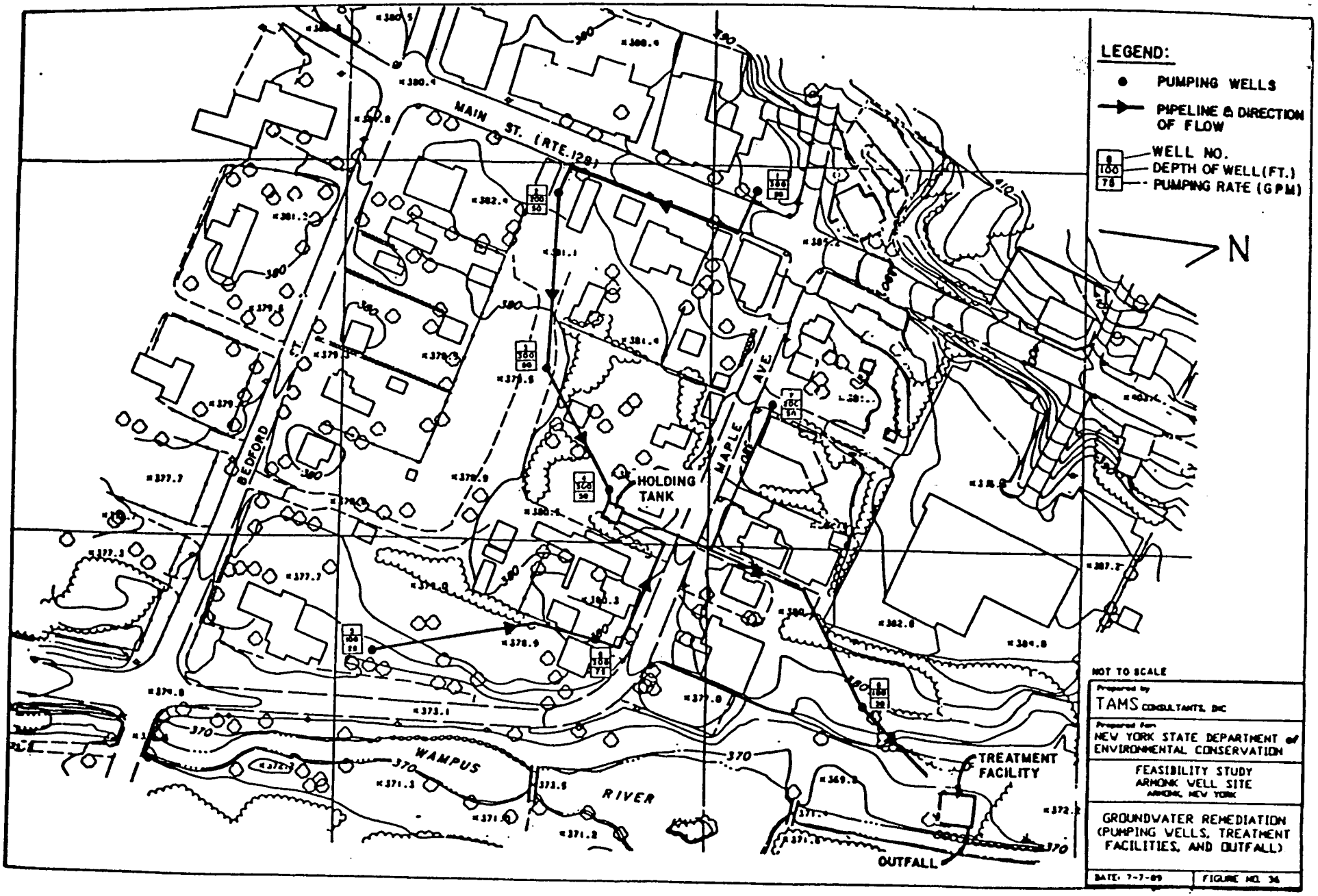


FIGURE 7 - ASSUMED GROUNDWATER REMEDIATON PUMPING SCHEME

G.4 - Off-site treatment with air-stripping and a carbon adsorption system at the local sewage treatment plant (STP) and discharge with the STP's effluent.

G.5 - On-site treatment with a carbon adsorption system and discharge to Wampus River.

G.6 - Similar to G.5 except treated water would be reinjected into the aquifer.

G.7 - Off-site treatment using carbon adsorption at a local STP and discharge with STP outfall.

All groundwater remedial actions are equally effective and can be implemented, therefore, all were retained for the detailed analysis.

C. Evaluation of Alternatives

During the detailed evaluation of remedial alternatives, each alternative was assessed against seven evaluation criteria:

1. Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and described how risks posed through each exposure pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with standards addresses whether or not the remedy will meet NYSDEC cleanup standards or provides grounds for invoking a waiver.

3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

4. Reduction of toxicity, mobility or volume is the anticipated performance of the treatment technologies a remedy may employ.

5. Short-term effectiveness addresses the period of time needed to achieve protection, and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. Ability to implement is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. Cost includes estimated capital and operation and maintenance cost, and net present worth costs.

D. Comparison of Vadose Zone Remedial Alternatives

Overall protection of human health and the environment: Alternative V.1 would not provide adequate overall protection. Alternatives V.2 and V.5 would reduce potential health and environmental risk significantly. However, they do not provide overall protection because of contaminants remaining in the vadose zone. Alternatives V.4, V.7 would provide adequate overall protection.

Compliance with standards: V.1 would not comply with standards. V.2 and V.5 may not comply with standards if removal (V.5) [or partial removal (V.2)] of sources does not reduce contamination in the surrounding vadose zone. Alternatives V.4, V.7 comply with State and local criteria and Federal advisories.

Long-term effectiveness and permanence: V.1 does not alter the risk of public health and the environment by relying solely on institutional land use restrictions to prevent exposure. For V.2 and V.5, if contamination levels in the source vicinities are high, there will be significant residual risks. They also rely solely on institutional restriction to prevent any excavation in these areas. For Alternatives V.4 and V.7, vacuum extraction efficiently removes contamination and carbon adsorption removes contamination from the gas. There are slight risks involved from trapped untreated residuals and monitoring will be required to verify the performance of the extraction system.

Reduction of toxicity, mobility or volume: V.1 does not reduce toxicity, mobility or volume. V.2 and V.5 significantly reduce the volume of contaminants (V.5 more so than V.2). Toxicity and mobility may continue to be of concern for both. V.4 and V.7 will significantly reduce volume, and toxicity and mobility are no longer of concern.

Short-term effectiveness: There will be adequate protection of the community and workers during remedial action for all the alternatives. Source removal will be completed in one month and for V.4 and V.7, vacuum extraction and treatment will be completed in one year. Natural clean up may occur due to volatilization and flushing of contaminants during percolation of rainwater. However, no estimates have been made for how long this will take. For all of the alternatives, there will be slight adverse impacts due to fugitive dusts and volatiles emissions during construction.

Ability to implement: There are no technical difficulties with any of the alternatives and materials and services are also available for each. V.1 will require coordination between agencies to enforce land use restrictions. For all of the remedial activities there are permit requirements for construction and landfilling. In addition V.4 and V.7 would require permits for off-gas emission.

Costs:

	Vadose Zone Alternatives	Present Worth Costs
V.1	No Action/Limited Action	1,047,415
V.2	Partial Source Removal/Off-Site Disposal	1,115,015
V.4	V.2 plus Gas Collection/On-Site Treatment	3,170,091
V.5	Full Source Removal/Off-Site Disposal	4,476,215
V.7	V.5 plus Gas Collection/On-Site Treatment	6,205,818

E. Comparison of Groundwater Remedial Alternatives

Overall protection of human health and the environment: With the exception of G.1, all of the alternatives significantly reduce the risks associated with groundwater contamination by removal and treatment of the contamination.

Compliance with standards: Alternative G.1 would not comply with Federal and State standards, all others will.

Long-term effectiveness and permanence: G.1 only slightly lowers the risk to public health and the environment, relying solely on well closure and drilling restrictions to prevent exposure. For the remaining alternatives there is a slight risk that untreated residuals remain trapped due to the heterogeneous nature of the aquifer. Periodic monitoring will be required to assess the performance of any of these alternatives. For alternatives G.3 and G.6 there is also a slight risk of failure due to difficulties with reinjection of the treated water.

Reduction of toxicity, mobility or volume: G.1 does not provide any reduction of toxicity, mobility or volume. For all other stated alternatives, toxicity, mobility and volume are no longer of concern.

Short-term effectiveness: For all of the alternatives there will be adequate protection of the community and workers. Natural cleanup may occur for alternative G.1 due to dilution and volatilization at downgradient discharge locations. Although no estimate has been made of how long this natural cleanup would take, for costing purposes, monitoring was assumed to continued for 15 years. For alternatives G.2, G.3 and G.4 there may be minor air impacts from the air stripping towers. For alternatives G.3, G.4, G.6 and G.7 there are slight risks of contaminating uncontaminated areas, and for G.2, G.5 and G.7 a slight risk of surface water contamination. For all of the pump and treat alternatives, there will be an aquifer draw down during groundwater extraction and minor air impacts due to fugitive dusts and volatile emissions during construction.

Ability to implement: The materials and services required for all of the alternative are readily available, also there are no technical difficulties with the exception of G.3 and G.6 which have a slight risk of problems during reinjection. All of the alternatives will require a number of permits, none appreciably greater than another, except for alternatives G.4 and G.7 which would be subject to obtaining a Part B RCRA permit to operate the treatment facility at the STP.

Costs:

	Groundwater Alternatives	Present Worth Costs
G.1	No Action/Limited Action	366,846
G.2	Air Stripping, Carbon Adsorption Surface Water Discharge	7,308,308
G.3	G.2 except Groundwater Reinjection	7,623,065
G.4	G.2 at Local STP	7,708,000
G.5	Carbon Adsorption, Surface Water Discharge	5,273,949
G.6	Carbon Adsorption, Groundwater Reinjection	5,548,231
G.7	G.5 at Local STP	5,673,949

Note: Cost Estimates for Alternatives G.2 through G.7 include $2,000,000 for the municipal water supply.

THE SELECTED REMEDY

V.4 Vadose Zone

- Removal of Liquid Wastes and Sludge from the Septic Tank
- Off-Site Treatment of Liquid Wastes and Sludge
- Removal of the Septic Tank
- Off-Site Disposal of Septic Tank Materials
- Soil Gas Collection by Vacuum Extraction
- On-Site Treatment of Extracted Gases Using Carbon Adsorption
- Soil Gas Monitoring
- Land Use Restrictions Pending Completion of Remediation

G.5 Groundwater

- Pumping
- On-Site Treatment Using Carbon Adsorption
- Discharge of Treated Water to the Wampus River
- Municipal Water Supply
- Groundwater Monitoring
- Well Use and New Well Drilling Restrictions Pending Completion of Remediation

A. Rationale for Selection

Vadose Zone

Of the alternatives retained for the detailed analysis, V.4 (Partial source removal/off-site disposal/active gas extraction and treatment using carbon adsorption) provided the best balance of the seven evaluation criteria previously described. Removal of the septic tank(s) and off-site treatment of liquid wastes and sludges would permanently prevent any future release of concentrated contaminants to the environment. The active soil gas extraction will reduce the level of contamination in the leachfield and surrounding soils to the point where residuals would no longer threaten the quality of the groundwater, and the carbon adsorption treatment of the extracted gases would permanently prevent the contaminants from entering the environment again. By comparison, alternatives V.5 (leachfield removal) may leave contamination in the surrounding soils and was much more expensive. Alternative V.7 (leachfield removal and active gas extraction of surrounding soils) would have been as effective as Alternative V.4 but also costs much more. Alternative V.2 is much less expensive than the selected Alternative V.4, however, it is very likely that V.2 (removal of septic tank only) would leave unacceptably high levels of contamination in the leachfield and surrounding soils. Alternative V.4 is protective, permanent, reduces volume and mobility of the contaminants, is likely to achieve the response objectives, and is the least expensive of the alternatives offering similar technical effectiveness and protection of human health and the environment.

Groundwater

The groundwater treatment alternatives ranked very similarly when evaluated against the seven criteria previously described. They all are permanent, protective of human health and the environment, and all utilize technologies that significantly reduce the volume and mobility of the contaminants. During implementation they may all have minor environmental impacts as well as a slight risk of untreated residuals due to the hetrogeneous nature of the aquifer. The added cost of Air Stripping without any environmental benefit from it essentially eliminated Alternatives G.2, G.3 and G.4. The added cost of groundwater reinjection as well as the potential of technical difficulties for Alternative G.6 and the added cost and potential administrative difficulties with Alternative G.7 lead to the selection of G.5.

B. Detailed Cost Estimate of Selected Remedy

CAPITAL COSTS - GROUNDWATER REMEDIATION

Item	Total Costs (1990 $)
Individual Technology	
Groundwater Extraction	200,000
Granular Activated Carbon	740,000
Discharge to Surface Water	143,000
Municipal Water Supply	2,000,000
Site Access Restrictions	130,000
Site Costs	
Site Preparation	8,000
Site Administration	16,000
General Conditions	
Startup Costs	47,000
Bid Contingencies	240,000
Scope Contingencies	220,000
Legal Costs	61,000
Services (during construction)	86,000
Total Capital Cost	$3,891,000

O & M COSTS - GROUNDWATER REMEDIATION

Item	Total Costs (1990 $)
Individual Technology	
Groundwater Extraction	72,000
Granular Activated Carbon	150,000
Discharge to Surface Water	280
Site Access Restrictions	70,000
General Conditions	
Insurance	44,000
Indirect Costs	
Administrative	60,000
Contingencies	50,000
Total Annual O&M Cost	$436,280

CAPITAL COSTS - VADOSE ZONE REMEDIATION

Item	Total Costs (1990 $)
Individual Technology	
Pumping Liquid Waste & Sludge	5,600
Septic Tank Excavation	11,000
Transportation, Off-Site Treatment of Liquid Wastes and Sludge	17,000
Transportation of Septic Tank Materials to Landfill	1,200
Off-Site Landfill Disposal	2,000
Gas Monitoring Well Installation	25,000
Soil Vapor Extraction	880,000
Vapor Phase Carbon	340,000
Soil Gas Monitoring	3,200
Site Access Restrictions	59,000
Site Costs	
Site Preparation	8,000
Site Administration	170,000
General Conditions	
Startup Costs	61,000
Bid Contingencies	340,000
Scope Contingencies	300,000
Legal Costs	65,000
Service (during construction)	91,000
Total Capital Cost	$2,379,000

O & M COSTS - VADOSE ZONE REMEDIATION

Item	Total Costs (1990 $)
Individual Technology	
Soil Vapor Extraction	290,000
Vapor Phase Carbon	160,000
Soil Gas Monitoring	130,000
Site Access Restrictions	3,200
General Conditions	
Insurance	87,000
Indirect Costs	
Administrative	100,000
Contingencies	100,000
Total Annual O & M Cost	$870,200

Remedial Cost Summary

Capital Costs (1990 $)

Vadose Zone Remediation	:	$ 2,379,000
Groundwater Remediation	:	3,891,000

O&M Costs (1990 $)

Vadose Zone Remediation	:	870,200
Groundwater Remediation	:	436,280 [1]

Annual Expenditures Projection [2]

Remedial Components	Year 1 (1990)	2 (1991)	3 (1992)	4 (1993)	5 (1994)
Vadose Zone	$2,379,000	$ 913,710	–	–	–
Groundwater	3,891,000[3]	458,094	480,999	505,049	530,301
Total	$6,270,000[3]	$1,371,804	$480,999	$505,049	$530,301

Notes

(1) Does not include O&M costs for municipal water supply system.

(2) Assumptions:

- All capital outlays will occur in Year 1 (i.e., 1990).
- O&M outlays will occur in Years 2 through 5.
- Vadose zone remediation will require one year.
- Groundwater remediation will require four years.
- Inflation of O&M costs will remain steady at 5 percent for Years 2 through 5 (i.e., 1991 through 1994).

(3) Includes $2,000,000 capital outlay for the water supply system being funded separately.

C. Conceptual Design and Additional Testing

Of the three sources identified in the Remedial Investigation, only the septic tank for Country Cleaners Dry Cleaning was located. It is anticipated that early in design the septic tanks of the other two sources will be located and removed as necessary.

For the purposes of estimating costs and conceptual design the vacuum extraction and groundwater pumping schemes were assumed as depicted in Figures 5 and 7, respectively. Estimates of the area and quantities to be treated are contained in Table 1.

During the early stages of design, additional investigation and testing will be performed to further refine the actual extent of these remediation schemes. The additional investigation and studies which will be performed during design will include:

1. Investigation of septic tanks for Nails, Etc. and Cleaning by Frederick's;
2. A study of the environmental impact of discharging the treated pump water into the Wampus River;
3. Additional soil gas sampling in conjunction with soil sampling and testing to further define the extent of soil gas treatment required;
4. Baseline air sampling;
5. Tests to further define aquifer characteristics and effectiveness of pumping or removal of contaminants, and
6. Installation of additional monitoring wells to further define the extent of groundwater contamination, particularly in the vicinity of the Wampus River.

Table 1: ESTIMATED QUANTITIES FOR SELECTED REMEDIAL ACTION

Approximate Quantities of Source Removal Operations

Source #2 - Country Cleaners

Volume of Liquid Wastes	:	1,500 gal
Volume of Sludge	:	750 gal
Volume of Crushed Septic Tank	:	12 yd^3

Approximate Quantities Associated with Vacuum Extraction & Treatment Operations

Area of Remediation

Source #1	:	35,000 ft^2
Source #2	:	75,000 ft^2
Source #3	:	40,000 ft^2

Vacuum Extraction

Depth of Wells	:	12 ft.
Quantity of Wells	:	56
Flow Rate/Well	:	To be determined based on capacity of mobile carbon adsorption units.

Treatment (Vapor Phase Carbon)

Flow Rate	:	To be determined based on capacity of mobile carbon adsorption units.
Inflow Concentration	:	500 ppb
Carbon Requirement	:	To be determined based on capacity.

Approximate Quantities Associated with Groundwater Remediation

Extraction Wells

Quantity of Wells	:	8
Depth of Wells	:	As shown in Figure 7
Diameter of Wells	:	8 in.

Conveyance Facilities

Total Length of Pipeline	:	2,500 ft.
Diameter of Pipeline	:	8 in.

Treatment Facilities

Treatment Units	:	Liquid phase carbon unit
Flow	:	600 gpm
Influent Concentration	:	
PCE	:	5,000 ppb
TCE	:	100 ppb
DCE	:	200 ppb

Outfall

Length of Pipeline	:	50 ft.
Diameter of Pipeline	:	15 in.

IX. ENFORCEMENT STATUS

The sources of primary contaminants at the AWS have been identified as being one former and two existing dry cleaning establishments.

Source No. 1 is the former 396 Limited Dry Cleaner, currently the Nails, Etc. facility located at 400 Main Street. As a dry cleaner, the property was owned and operated by Mr. Longo who sold the property to Holmes and Kennedy Realty. As Nails, Etc., the property is owned by Holmes and Kennedy Realty, Chappaqua, NY. Source No. 2 is the Country Cleaners Dry Cleaner on Maple Avenue; owned and operated by Mr. Tartaglia of the same address. Source No. 3 is Cleaning by Frederick's Dry Cleaners in the A&P Shopping Center. The A&P Shopping Center is owned by Mr. Fumano of Armonk who leases this property to Mildred Werber of Elmhurst, NY. A Mr. Mastroianni is the owner and operator of Cleaning by Frederick's.

In February of 1989, a 60-day letter was mailed to the persons noted above informing them of the State's intent to conduct a design study. No formal reply was received within the 60-day period. However, meetings have been held (June 13, 1989 and February 14, 1990) with these PRPs to discuss their possible assistance in remediation.

During the public comment period at the conclusion of the RI/FS investigation, a letter from Carpenter, Bennett & Morrissey Law Offices on behalf of Cleaning by Frederick's was received, contending that the State misappropriately identified it as a source. Copies of this letter and the State's comments on it are located at the end of the Responsiveness Summary (Appendix B).

X. SUMMARY OF THE STATE'S DECISION

The preferred remedial alternatives outlined in this document will provide a permanent solution to the contamination problems at this site. The removal of contaminated sludges and liquid wastes from the septic tanks will prevent the possibility of future discharges to the environment. Active gas extraction of the leachfields and surrounding contaminated soils will reduce the level of contamination and prevent further degradation of the groundwater. The pump and treat system will remove contaminants from the groundwater while preventing migration to currently unaffected aquifers. Using carbon adsorption to treat both the pumped groundwater and the extracted gasses will reduce the volume of the contaminants and effectively immobilize them, preventing future release to the environment.

The clean-up objectives for the groundwater are the most stringent among Federal and State Standards (5 ug/l for the principal contaminants found). The contaminated soils above the groundwater will be cleaned to such low residual concentrations that they would no longer be a source of groundwater pollution. This soil cleanup criteria also depends on the amount of organic carbon in the soil, which will be determined during design support testing and actual remediation.

As hazardous constituents migrate further from the sources, they become less concentrated, and in general it becomes more difficult to recover them; therefore, remediation will focus on the sources. Removing the septic tank(s) and contents eliminates the chance of future concentrated discharges to the environment. Active gas extraction, a proven technique, will reduce the level of contamination in the soil considerably and prevent further contamination of groundwater. Removing contamination from the groundwater, especially from the bedrock water zones, will be the most difficult task.

The proposed pump and treat process for groundwater is currently the only available technology for remediation of a contaminated aquifer. Although such systems reduce contaminant levels significantly, at very low contaminant concentrations such systems become inefficient. The RI/FS estimated that the groundwater clean-up objective would be reached in four years. Although this is a reasonable estimate, at the end of four years the need for additional or continued remedial action will be re-evaluated.

APPENDIX A

List of Documents in the Administrative Record

1. "Phase I Investigation Report, Village of Armonk Wells," Wehran Engineering, P.C., June 1983.

2. "Phase II Investigations, Village of Armonk Wells," Wehran Engineering, P.C., June 1985.

3. "Technical Proposal to Conduct a Remedial Investigation/Feasibility Study, Design and Construction Oversight for the Armonk Wells Site, Westchester County, New York," TAMS Consultants, Inc. September 1986.

4. "Cost Proposal for the Remedial Investigation/Feasibility Study, Design and Construction Oversight for the Armonk Well Site, Westchester County, New York," TAMS Consultants, Inc., September, 1986.

5. "Contract for a Remedial Investigation/Feasibility Study of the Armonk Well Site," TAMS/GZA/ERC, February, 1987.

6. "Public Participation Plan for the Armonk Well Site," New York State Department of Environmental Conservation, June 1987.

7. "Work Plan, QA/QC Plan, Health and Safety Plan, for the Remedial Investigation/Feasibility Study at the Armonk Well Site, Westchester County, New York," TAMS Consultants, Inc., July, 1987.

8. "Geophysical Studies, Armonk Well Site, Armonk, New York," Hager-Richter Geoscience, Inc., December, 1987.

9. "Remedial Investigation Report, Armonk Well Site, Armonk, New York, Volumes I, II and III," Goldberg-Zoino Associates of New York, P.C., February, 1989.

10. "Feasibility Study Report, Armonk Well Site, Armonk, New York," TAMS Consultants, Inc., August, 1989.

11. "Proposed Plan for Remediation of the Armonk Private Wells Site," NYSDEC Division of Hazardous Waste Remediation, January, 1990.

APPENDIX B

RESPONSIVENESS SUMMARY

The New York State Department of Environmental Conservation (NYSDEC) held a public meeting on January 30, 1990 at the North Castle Town Hall Annex to discuss the findings of the Armonk Private Wells Site Remedial Investigation/ Feasibility Study (RI/FS). Present at the meeting were representatives from NYSDEC, Westchester County Health Department, TAMS Consultants, Town of North Castle and concerned citizens.

The RI/FS was made available for public view on December 17, 1989 at the following locations:

* NYSDEC Region 3 Office, New Paltz, New York
* North Castle Public Library, North Castle, New York
* North Castle Town Hall, Armonk, New York

SUMMARY OF PUBLIC CONCERNS AND NYSDEC RESPONSES

Q.1 Who is going to pay for this remedial action?

Ans. The taxpayers initially. The State will pursue those parties responsible for the contamination in order to recoup the expenditures.

Q.2 Have any of these remedial procedures been tried anywhere else and how successful have they been?

Ans. The proposed treatment technology, carbon adsorption of organics, has been successfully applied in many industries over many years; it is a well-established technology. The procedure of vacuum extraction is fairly new, however, results have been very promising, including its successful application at sites similar to Armonk. Pump and treat systems are being used at many federal and state cleanups to successfully remove contaminants from groundwater. The ability to reach cleanup goals using pump and treat systems has varied, mainly due to the high variability of hydrogeologic and soil/chemical conditions of the sites.

Q3 At what point does the State commit to these specific proposals? At what point do the property owners lose their ability to provide their own plan and present it to the State?

Ans. The State is committed to this proposal pending the results of the public comment period (concludes on February 20, 1990). Written comments and suggestions heard at the public meeting will be incorporated into a document called the Record of Decision (ROD) (anticipated in March, 1990), which documents the results of the RI/FS and public participation activities. It also commits the state to the prescribed remedy. This will not, however, preclude the property owners form performing portions or all of the necessary work upon legal agreement with DEC. Other possible remedies may result based on design work. If there are significant changes, further public participation will be sought; the Record of Decision will be reviewed and may be reopened.

Q4 What is the schedule for implementation of the proposed remedial action, physically?

Ans. The first step toward construction of these systems will be a design contract which could be awarded during 1990. Some of the work, such as the septic tank removal, may be completed using standby contractors, which could be done during 1990. The vacuum extraction and pump and treat systems will require additional design support testing. It is not anticipated that construction of these systems would begin during 1990.

Q5 Are the dollars in place for implementation of this remedy?

Ans. Yes. State Superfund money is available to do the work planned for 1990. Specific budget allocations are being made as remedial design and construction contracts are processed. We are committed to this proposed plan pending the results of public comment.

Q6 Where can I get a copy of the RI/FS reports?

Ans. The reports are located in the North Castle Town Hall, the North Castle Public Library and the NYSDEC Region 3 Office for public viewing or photocopying.

Q7 Will the new water system be operational before the pump and treat system gets started?

Ans. EPA plans to complete the installation of the water mains during 1990, which will be before the pump and treat system will begin.

Q8 Why do we have to spend the money for cleaning the groundwater, considering the Town of Armonk will be getting a new potable water supply from the EPA work currently in progress?

Ans. We believe we have a responsibility to restore the groundwater resource to a quality which satisfies its best intended use, which in this case would be a source of drinking water. We are under a mandate to protect our natural resources, which includes groundwater. Maybe we don't need this resource right now, but what about future generations? The no-action alternative was considered in this study and was found to be non-permanent and not protective of human health and the environment. The costs involved with remediation were considered in this evaluation, and it was determined that the benefits of remediation now outweighed the monetary costs.

Q9 If no action were taken, wouldn't the level of contamination continue to decrease as it appears it has in the past?

Ans. The types of contaminants at this site are relatively persistent; they do not biodegrade rapidly. Drops in contaminant concentration are almost entirely attributed to dilution. In other words, they are spreading out, contaminating a larger area. It is the conclusion of the RI/FS that it is best to stop this spreading and remove the sources now rather than allow this to progress further.

Q10 Is it the soil or the water that is contaminated below the water table?

Ans. It is difficult to distinguish between the two. The water and the soil are contaminated. Generally, we talk about contaminated soil above the water table and contaminated water below it.

Q11 If you eliminated the sources of contamination (septic tanks and leach-fields), would, in time, nothing else have to be done?

Ans. Removing the sources will prevent additional chemical contamination from entering the groundwater, however, the level of contamination already in the groundwater is high enough to be considered source also; with the potential to contaminate a much larger area with levels above health standards.

Q12 It was briefly mentioned that other contaminants were found. What are they? Is there another source or other responsible parties?

Ans. Other priority pollutant metals, phenols, carbon tetrachloride, and other volatile organic compounds were detected in some of the sampling rounds. These were not detected consistently, however, they will be investigated further during design support testing.

Q13 The proposed remedial action calls for the removal of septic tanks. How many tanks are there and on whose property are they?

Ans. One septic tank was located and sampled during the investigation behind Country Cleaners. It is suspected that there are two more septic tanks that will be removed, one behind Nails, Etc. and one behind Cleaning by Frederick's (A&P Shopping). However, this will have to be confirmed during design.

Q14 It seemed to take an awfully long time to install monitoring wells for this study compared with supply wells around here, why is that?

Ans. Monitoring wells have a special purpose and must be constructed in a particular way to strict specifications. A well for drinking water may be installed using methods not appropriate for a monitoring well. Most drinking water wells are open holes, while monitoring wells require casing and seals placed carefully so that samples at a particular depth can be obtained. Also, construction techniques for a monitoring well are somewhat limited, especially when certain soil conditions exist as was the case at Armonk.

Q15 Are there any maps of the aquifer recharge areas of downtown Armonk? Where does the water come from? Where is it going to?

Ans. A broad view of the Armonk recharge area was considered, however, more detail than that is needed to determine contamination patterns. Local groundwater flow in the overburden and bedrock is generally northwest to southeast with an estimated groundwater velocity ranging from 5×10^{-4} to 2 feet per day in the sand overburden and 9×10^{-5} to 2 feet per day in the bedrock. The Wampus River appears to act as a localized groundwater

discharge area for the overburden water bearing zone. However, groundwater in the lower overburden and bedrock appears to flow under the Wampus River. The groundwater flow in the area of the Wampus River will be further investigated during design work.

Q16 Assuming we have a complete remediation and left some contaminants in the ground--what effect would that have on property. Would it be a non-contaminated property?

Ans. Under current laws, the owners of properties associated with the source of contamination are considered potentially responsible parties, regardless of the remedial action taken. Once the groundwater is restored to drinking water standards, unless new information is obtained, the area can be proposed for delisting.

Q17 Figure 6 of the PRAP shows a sketch of the piping system for the pump and treat system. Is this how you plan to do it? Will the pipes run underground?

Ans. The pipes will most probably run underground. As far as where the pipes will run--Figure 6 (Figure 7 of the ROD) is a conceptual plan used for estimating quantities. During design, the actual location of pipes and wells will be established. The final piping location will minimize disturbing the normal activities of the community.

Q18 Was there any consideration given to using the pump and treat system as the new water supply?

Ans. Yes, that was considered early, but it was not fully evaluated in this FS. A new drinking water supply is subject to quality standards. Health Department approval of a new water system using an existing contaminated source is unlikely, especially when clean sources are readily available.

Q19 I have a deep well outside the plume you have shown--how long would it be before this contamination gets to my well? How will the pump and treat system effect my well (the new water system will not be servicing my street).

Ans. Based on your location (upgradient of the plume) it is unlikely that the contamination will reach your well. The pump and treat system will also be pulling the plume away from your location. Right now we anticipate pumping and treating slightly more water than is currently being used in downtown Armonk. It would be unlikely that this would lower the water level in your well.

CARPENTER, BENNETT & MORRISSEY

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February 20, 1990

VIA TELECOPY AND FIRST CLASS MAIL

Alice M. McCarthy, Esq.
New York State Department
of Environmental Conservation
202 Mamaraneck Avenue
White Plains, New York 10601-5381

RE: Armonk Wells Site ("AWS")

Dear Ms. McCarthy:

This letter is submitted on behalf of Cleaning By Frederick in connection with the above-referenced matter wherein New York State Department of Environmental Conservation ("NYSDEC") has completed the remedial investigation and feasibility study ("RI/FS") and is currently awaiting the expiration of the thirty day public comment period so that it can proceed to select a remedy. We respectfully request that the NYSDEC consider the comments contained in this letter in connection with its remedy selection process and make them part of the administrative record in this regard.

According to the Executive Summary attached to the FS, the NYSDEC is planning to remediate the Vadose Zone and the groundwater at AWS. More specifically, the NYSDEC indicated at a public meeting held January 30, 1990, in North Castle, New York that it will recommend the removal of septic tanks and septic tank leachfields as well as either passive gas venting or active gas extraction and gas treatment for the Vadose Zone.

With regard to the removal of septic tanks and septic tank leachfields, the NYSDEC has stated on several occasions that it is only aware of the existence of one such tank located on the property of Country Cleaners. There is no administrative record of any contamination of any other septic tanks (or even the existence of other tanks although they do exist). Therefore, there is no basis at this stage to include the removal of other septic tanks in the Vadose Zone remedial alternative. If indeed these tanks are not a source of significant contamination, then less expensive alternatives - appropriate to whatever level of contamination may be found should be selected. For example, it might prove to be appropriate to remove any sediments in the tanks, fill the tanks with an appropriate material such as sand and then seal the tanks. In this manner significant resources could be conserved while protecting the area from any further contamination. As matters currently stand, however, we feel that recommending any action on the other septic tanks is premature.

As far as the second aspect of the Vadose Zone remediation is concerned, the NYSDEC has indicated that it will recommend the V-3 passive gas venting or the V-4 active gas extraction and gas treatment alternatives. At a meeting between the PRPs and NYSDEC on or February 14, 1990, John Henkes of your agency indicated that the NYSDEC must conduct more soil tests to determine whether such alternatives are necessary. Therefore, we respectfully submit that a recommendation of NYSDEC of either alternative is again premature, especially in light of the fact that the PRPs' engineering consultant, Jim Hahn, is of the opinion that V-3 or V-4 are not necessary for the remediation of the site.

In addition to the foregoing, on behalf of Cleaning By Frederick we are distressed at what seems to be a general assumption by the NYSDEC that Cleaning By Frederick disposed of its dry cleaning solvents by dumping them down drains or in its backyard. Mr. Mastroianni maintains that his dry cleaning fluid was picked up by a disposal service from the beginning of his operation. Moreover, he contends that there is no basis to separate the AWS into three separate plumes as the NYSDEC and TAMS did in Figure 15 of the FS. In order to show contamination in the shallow overburden in such a variegated manner, the NYSDEC would need data to establish that the contamination in the shallow overburden is not contiguous. In other words, since the RI/FS does not show the absence of contamination between wells it is irresponsibly misleading to present that drawing with apparent uncontaminated white areas between contaminated grey plumes. It

is simply inappropriate to characterize the site as having three separate areas.

The more appropriate characterization of the site is contained in Figure 16 of the FS. In that drawing a high concentration of contaminants is depicted by an oval shaped plume. At the "top" of this oval is the site formerly used by Philip Longo (currently owned by Holmes & Kennedy Realty) and at the bottom is County Cleaners. Cleaning by Frederick is not even located within the broader grey area of that map depicting contamination in the bedrock groundwater. Cleaning by Frederick submits that if it ever dumped spent dry cleaning solvents into the ground then AW-4D and AW-4 (located in the lower right hand portion of the map) as well as AW-4R and SW-16 would have shown elevated levels of contaminants such as those found in Figure 21 of the RI. (Compare well AW-4D behind Cleaning by Frederick: PCE=8 TCE=ND; DCE-ND with AW-1D behind the Longo property PCE=6500; TCW=80; DCE=170). See also Figure 23 of the RI (compare SW-16, behind Cleaning by Frederick tetrachloroethene 13 micrograms per liter and trichloroethene 3 micrograms per liter with SW-8 on the Longo property with readings of 1000 and 5 micrograms per liter and with SW-2 with readings of 1306 and 19 micrograms per liter and SW-3 with readings of 1100 and 19 micrograms per liter near Country Cleaners). As matters currently stand the NYSDEC's data and Figure 16 of the FS show no contamination in the deep groundwater behind Cleaning By Frederick's, and this is inconsistent with allegations that Cleaning By Frederick improperly dumped dry cleaning fluid into the ground.

Accordingly, Mr. Mastroianni maintains that statements contained at page 1-6 of the FS and page 89 of Volume I of the RI, which claim that prior to 1984 his wastes were discharged into a leachfield behind Cleaning By Frederick, are incorrect. Apparently these statements were made by the Armonk building inspector and this inspector, as well as the NYSDEC, has ignored the possibility that the source of contamination in the soil and groundwater near the shopping center may be Mr. Longo's operation which has by far the highest groundwater contamination in the area. Consequently, Cleaning By Frederick respectfully submits that the information obtained by the Armonk building inspector is inaccurate to the extent that it implies that Mr. Mastroianni dumped spent dry cleaning fluid down a drain or into the ground.

In light of the foregoing, I would appreciate an opportunity to discuss these issues with you individually rather than as part of a PRP Group.

Very truly yours,

CARPENTER, BENNETT & MORRISSEY

Douglas H. Amster
for John F. Lynch, Jr.

DHA:jb

cc: Mr. John Henkes (via telecopy and First Class Mail) ✓

15 (12-75)

New York State Department of Environmental Conservation

MEMORANDUM

TO: Alice M. McCarthy, Esq., Senior Attorney
FROM: John L. Henkes, Sr. Sanitary Engineer, Eastern Project Section, BERA
SUBJECT: Comments on February 20, 1990 Letter to you from D.H. Amster on Behalf of Cleaning by Frederick's, Armonk Private Wells Site (#360005)
DATE: MAR 8 1990

As we discussed on February 27, 1990, the Amster letter will be addressed in the Responsiveness summary of the Record of Decision for the Armonk Site. To follow is a synopses of my comments.

First I would like to clear up some misconceptions about the State's Proposed Plan. At this time the State does not intend to remove the leachfields of the three septic systems, only the septic tanks. Leachfield removal was an alternative evaluated in the Feasibility Study (FS), however, the preferred remedy for these sources of contamination is active gas extraction with carbon adsorption. The FS showed this to be much less expensive and just as effective as source removal.

Justification for the active gas extraction is based in part on the very high soil gas measurements (732-14,400 ppb, PCE in the source areas) and a correlation developed for this site showing that PCE soil gas readings above 251 ppb would correspond to soil contaminant concentrations that would further degrade the groundwater. Based on all existing information to date, these sources will have to be addressed. The need for additional soil samples during design is to 1) refine the correlation between soil gas and soil contaminant concentrations, 2) further measure the level and distribution of organic carbon in the soil (necessary to establish how much of the contaminants are available for groundwater contamination) and 3) better establish the extent of treatment necessary. The possibility of a more economical method of addressing these sources will be reviewed after obtaining this additional information.

The proposed remedial plan calls for the removal of septic tank(s). It is true that only one septic tank was located and sampled during the RI. Before any other tanks are removed, they also will be located and sampled to establish the need to remove them. This work will be done in the near further, and I would appreciate help from the property owners in locating them. The septic tank behind Country Cleaners was located during the RI with the greatly appreciated help of the owner, Mr. Tartaglia. If initial field work does not locate the other two septic tanks, trenching will be used.

The rest of the subject letter contends that Cleaning by Frederick's was misappropriately identified as a source of contamination. The RI/FS results indicate that Cleaning by Frederick's is a source:

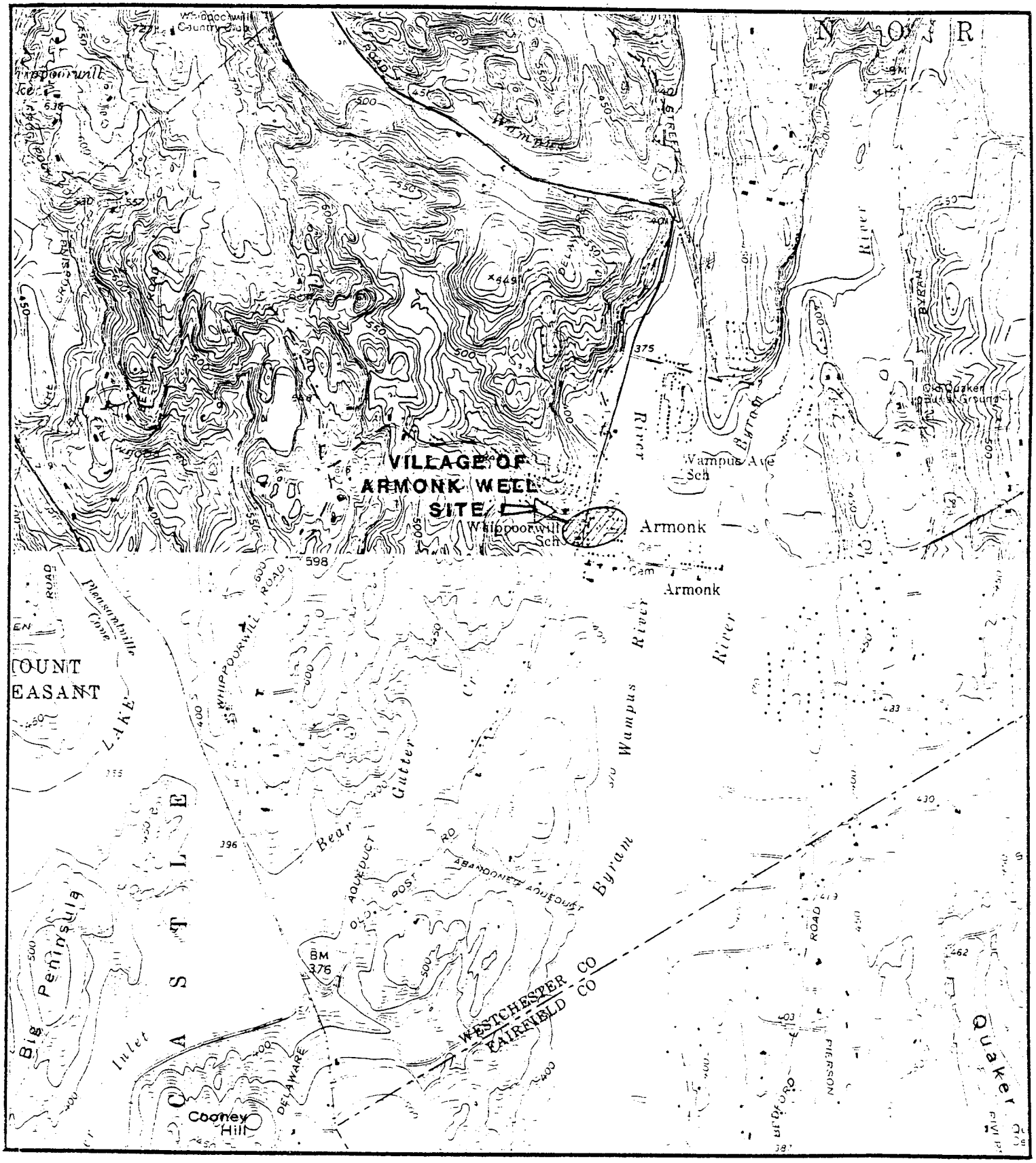
1. The four soil gas sampling points directly behind Cleaning by Frederick's had PCE concentration levels ranging from 7,130 to 14,400 ppb. All four measurements were considerably higher than any other sampling points in this study including the highest measurements near the other two sources (Country Cleaners' 732 ppb and Nails, Etc. 2036 ppb).

2. PCE, TCE and DCE were measured in samples collected from well AW-4S (just downgradient of Cleaning by Frederick's) at concentrations of 380 ppb, 4 ppb and 38 ppb, respectively. PCE and DCE were also measured in Well AW-10 approximately 250 feet downgradient from AW-4S at concentrations of 25 ppb and 23 ppb, respectively. None of these contaminants were detected in samples from a well upgradient of Cleaning by Frederick's (Well No. AW-9).

3. The soil gas PCE levels quickly dropped from 14,400 ppb to less than 10 ppb between Cleaning by Frederick's and the other two sources. A similar trend was also noted by the TCE soil gas concentrations. This clearly shows that Country Cleaners and Nails, Etc. are not the sources of contamination at Cleaning by Frederick's. See Figures 18 and 19 of the RI.

If you have any further questions regarding this site, do not hesitate to call me at (518) 457-1708.

cc: J. Slack
W. R. Foltin
A. Klauss



WE / CDM

MAP LOCATION

SCALE: 1" = 2000'
SOURCE: U.S.G.S. 7.5 MIN.
MT. KISCO, N.Y. -
CONNECTICUT
GREENVILLE, CT. -
NEW YORK
QUADRANGLES

FIGURE 1

SITE LOCATION MAP

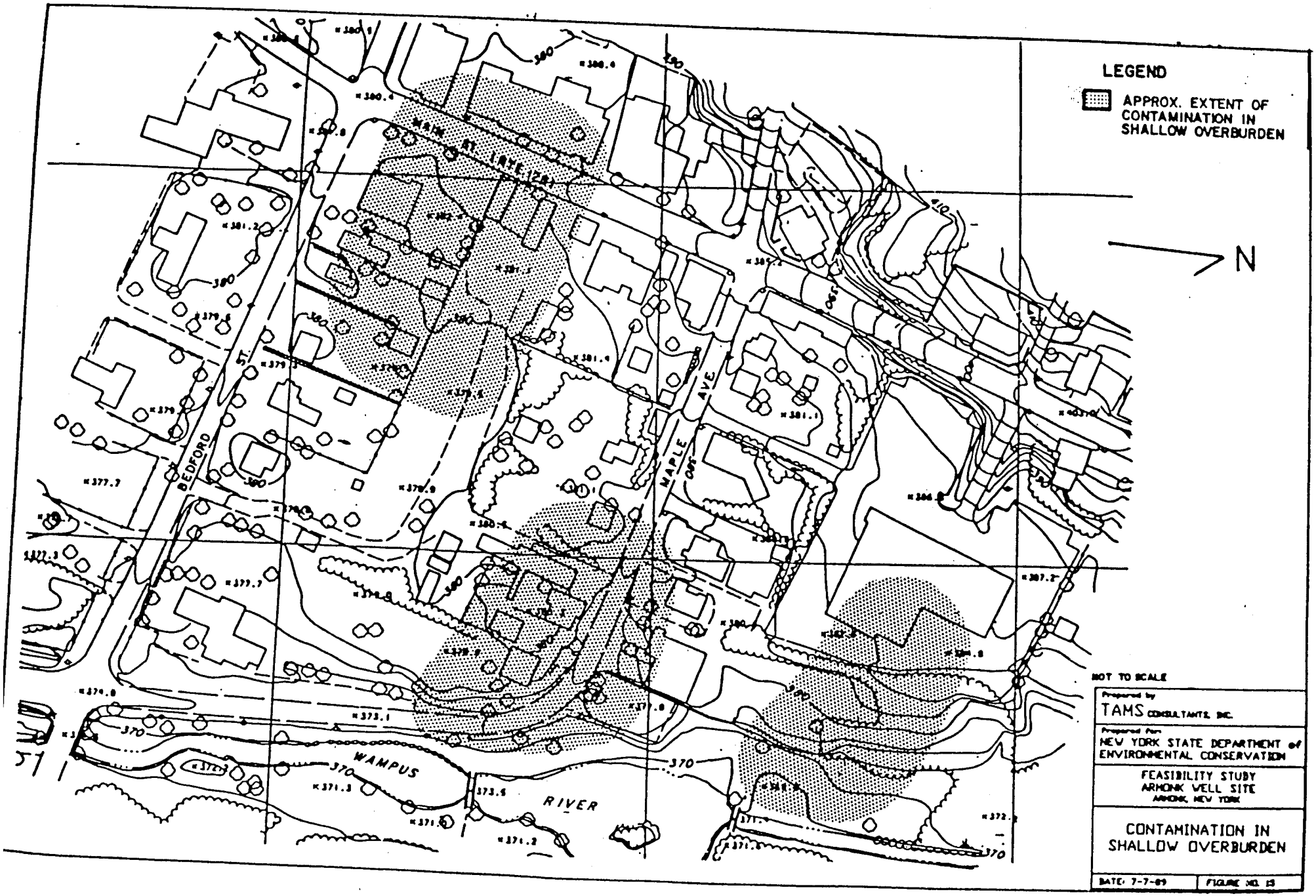


FIGURE 2 - APPROXIMATE EXTENT OF SHALLOW OVERBURDEN CONTAMINATION

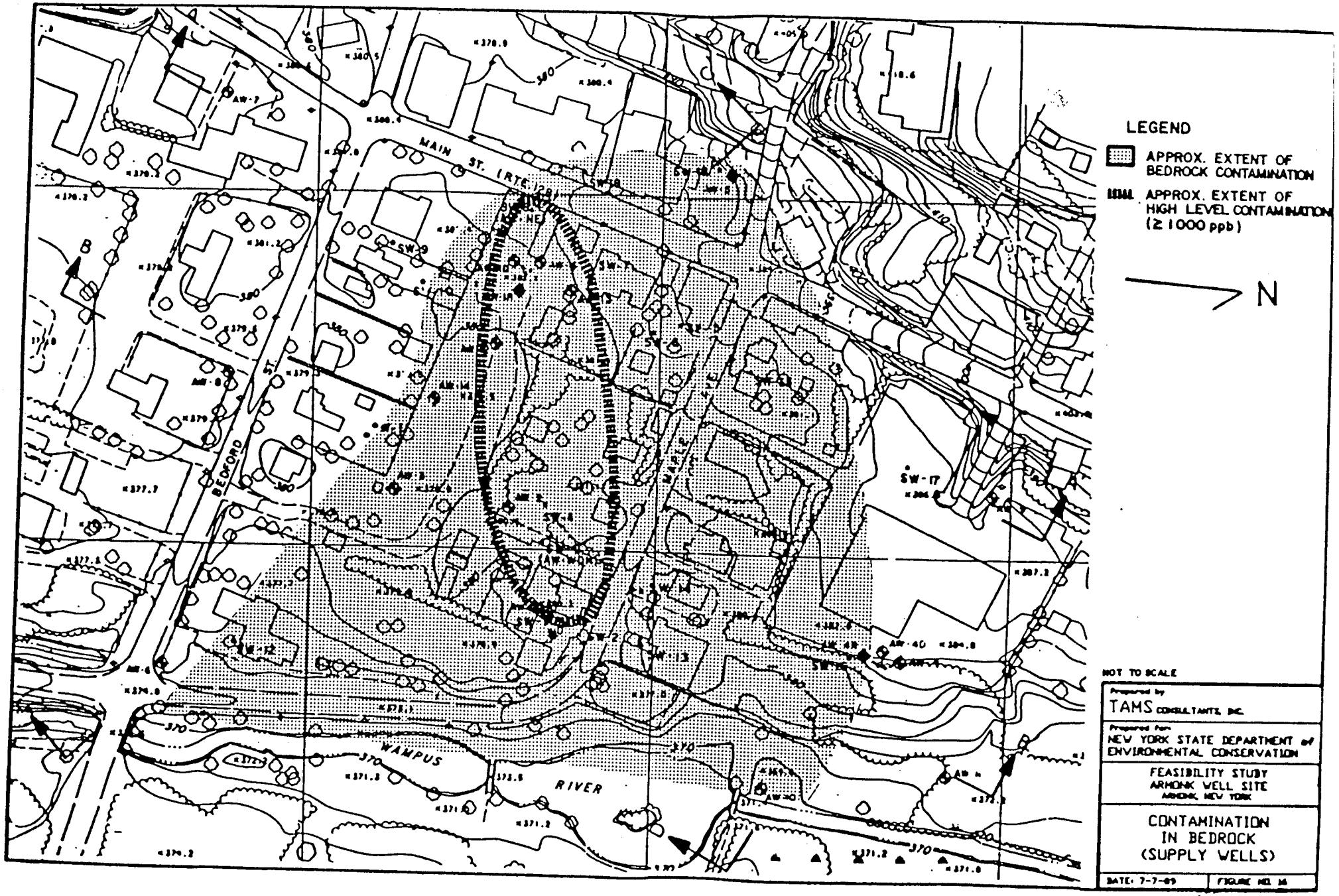


FIGURE 3 - APPROXIMATE EXTENT OF BEDROCK CONTAMINATION

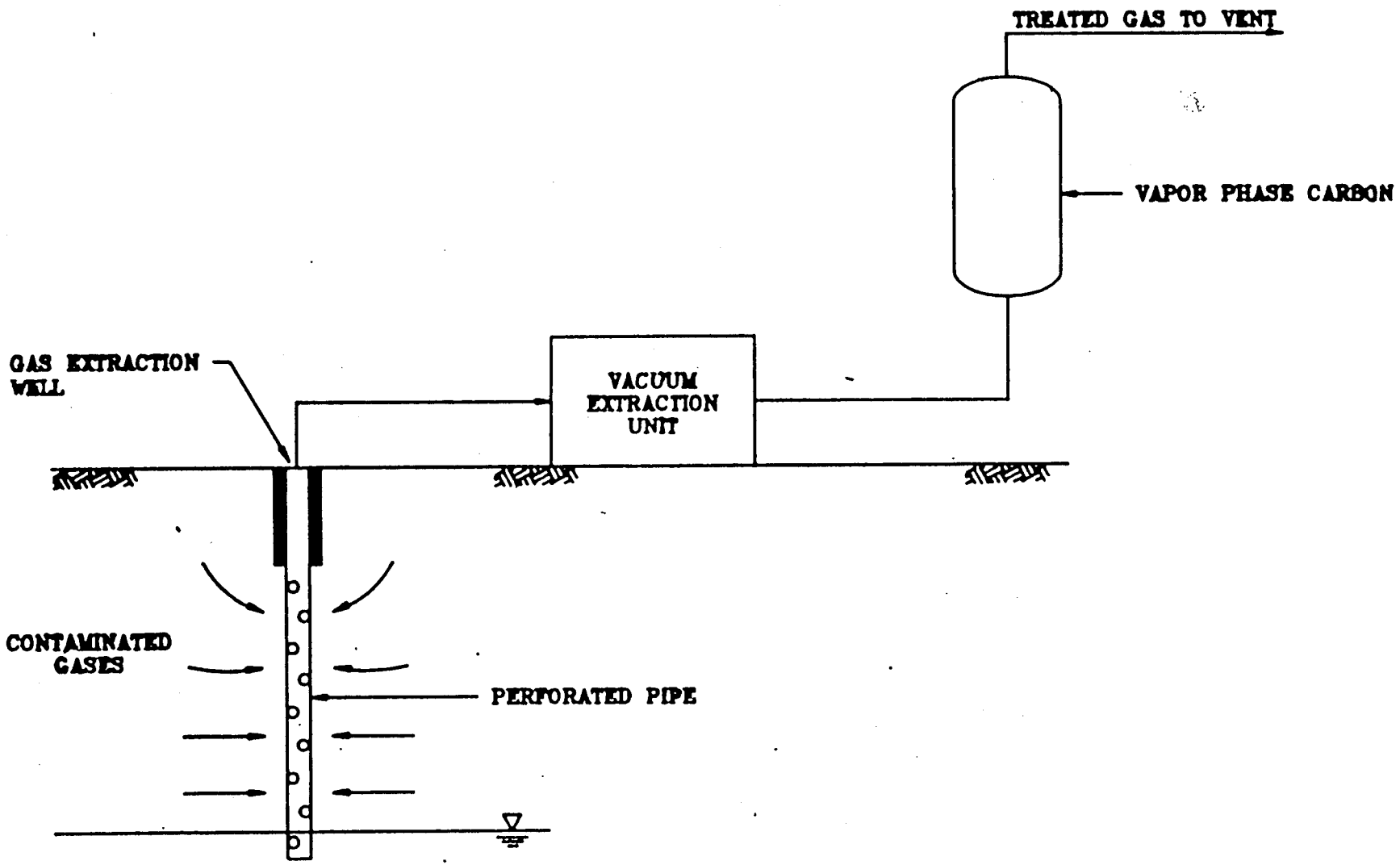


FIGURE 4

SCHEMATIC DIAGRAM OF VACUUM EXTRACTION AND TREATMENT

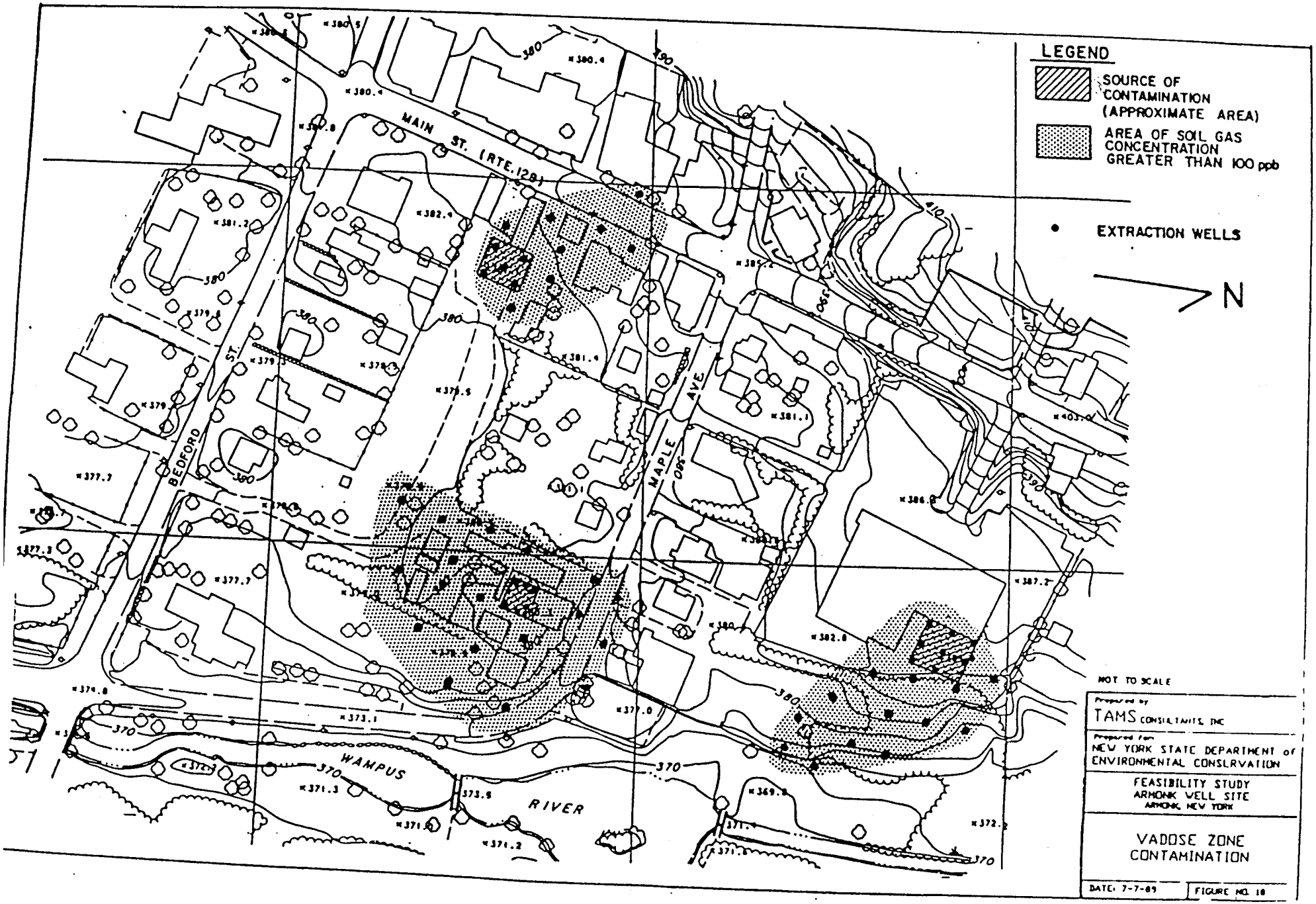


FIGURE 5 - ASSUMED AIR EXTRACITON REMEDIATION SCHEME

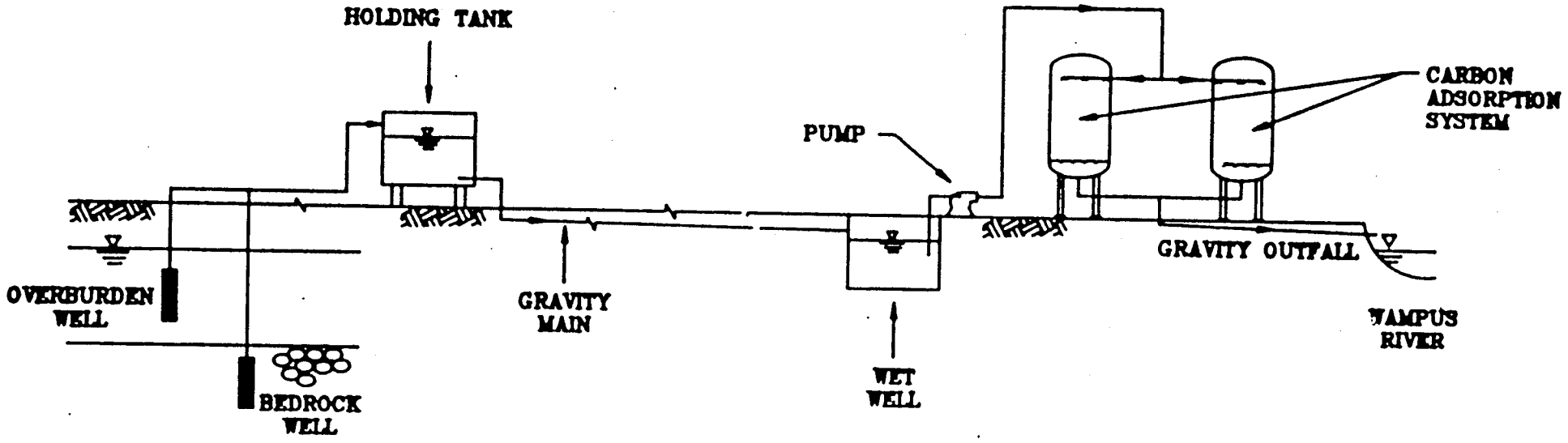


FIGURE 6

SCHEMATIC DIAGRAM OF GROUNDWATER REMEDIATION

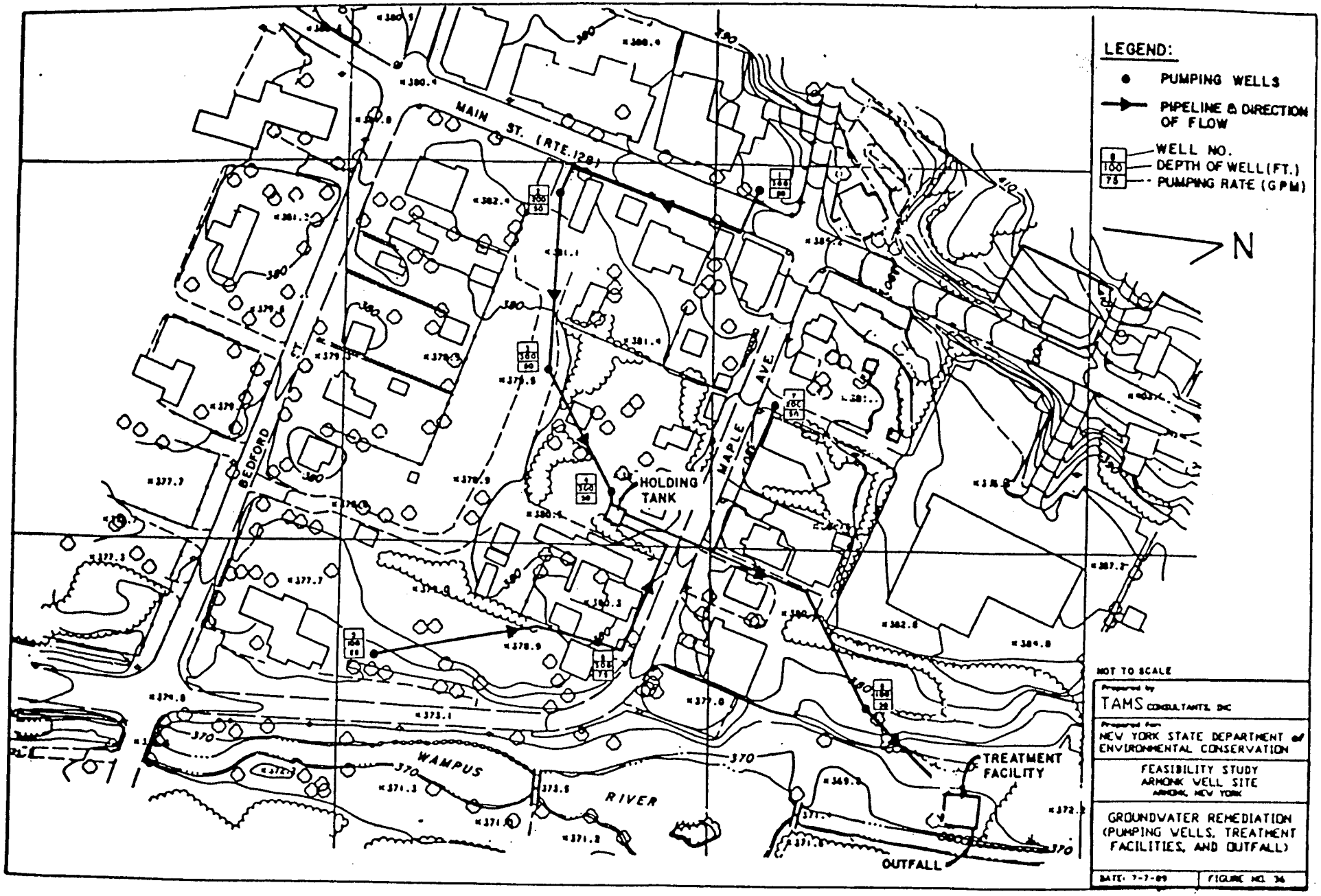


FIGURE 7 - ASSUMED GROUNDWATER REMEDIATON PUMPING SCHEME