REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Prepared for

Orange County Water Authority

June 1994

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INTRODUCTION

The Town of Wallkill's municipal water system consists of the Consolidated Water District and the Woodland Acres Water District (originally developed as a private community supply and acquired by the Town in the late 1980s). Both water districts are maintained by the Town's Water Department (Smith, 1993a).

Mr. William Johnson, the Assistant Commissioner of Public Works for the City of Middletown, indicates that the City relies solely on a network of four surface water reservoirs for its water supply. The system is operated and maintained by the City of Middletown Water Department (Johnson, 1993a).

EXISTING SURFACE WATER SUPPLY

The City of Middletown's water supply originates from four surface water reservoirs:

- Monhagen Lake
- Highland Lake
- Shawangunk Lake
- Kinch Diversion Reservoir.

All water supplied is treated by one of two active filtration plants. The Highland Treatment Plant services Highland Lake and the Monhagen Treatment Facility services the Monhagen Reservoir which is fed by Shawangunk Lake and the Kinch Diversion Reservoir. The City plans to install ozone injection to reduce the formation of disinfectant by-products.

Both Highland and Monhagen lakes are located in the southwestern corner of the Town of Wallkill and are entirely within the Town's borders (Groundwater Inventory Map ["GIM"]). Shawangunk Lake is situated east of Highland Lake and is partially within the Towns of Wallkill and Mount Hope (GIM). Kinch Diversion Reservoir is located entirely within the Town of Mount Hope.

EXISTING GROUND-WATER SUPPLIES

Consolidated Water District

The Town of Wallkill Consolidated Water District currently is supported by six independent well fields. The majority of water is supplied by the Braeside, Kosuga, and Crystal Run well fields. These well fields are each developed in separate unconsolidated sediment aquifers of limited extent in close proximity to the Wallkill River.

Well Supply in Service

A total of 18 active water production wells within the six well fields service the Wallkill Consolidated Water District. The well fields and number of active wells in each are listed below:

- Braeside (6 active wells) (GIM, Wells WL-4, WL-5, WL-6, WL-7, WL-11, and WL-12)
- Crystal Run (2 active wells) (GIM, Wells WL-21 and WL-22)
- Kischel (4 active wells) (GIM, Wells WL-13, WL-14, WL-15, and WL-16)
- Kosuga (3 active wells) (GIM, Wells WL-17, WL-19, and WL-20)
- Scotchtown Estates (1 active well) (GIM, Well WL-3)
- Scotswood (2 active wells) (GIM, Wells WL-1 and WL-2)

Fifteen of the 18 wells are located within their respective well fields (Braeside, Crystal Run, Kischel, and Kosuga) found along the banks of the Wallkill River and are installed within unconsolidated sediment aquifers. The three remaining wells, Scotchtown Estates Well 4 (GIM, Well WL-3) and Scotswood Wells 1 and 2 (GIM, Wells WL-1 and WL-2) are located upland and are installed in shale/bedrock. Three other wells in the Scotchtown Estates well field are abandoned. They are located near Well WL-3 (GIM, Wells WL-3A, WL-3B and WL-3C). A summary of available well data and well-yield capacities are provided in Tables 1 and 2A, respectively.

Well Supply Not in Service

Braeside Wells 5, 6, and 7, along with Kosuga Well 2 (GIM, Wells WL-8, WL-9, WL-10, and WL-18, respectively) have been removed from service. Braeside Wells 5, 6, and 7 were completed in the unconsolidated sediment aquifer during 1973, but were abandoned sometime prior to February 1981 (Camp Dresser and McKee, 1982). The Kosuga Well (GIM, Well WL-18) was completed in the unconsolidated sediment aquifer in 1975. This well was removed from service when it failed to recover from acid treatment. At all four of these wells elevated levels of iron and manganese resulted in

deposits forming on pumps and screens, reducing the yield from the wells. Mr. Edward Smith, Water Superintendent, anticipates that the wells will not be reinstated due to cost limitations (Smith, 1993b). Available well data are presented in Table 1.

Proposed Well Supply Not in Service

The Echo Lake well field, located southwest of the Town of Wallkill adjacent to the Wallkill River and within the Town of Goshen, contains two high-yield wells installed by the Town in 1989 (GIM, Wells GT-36 and GT-37). Recent analytical results indicate concentrations of iron and manganese that exceed drinking water standards. In addition, the well located nearest to the Wallkill River was found to receive recharge from the Wallkill River (surface water). The Town Water Department is currently addressing these issues and is actively pursuing the required water-taking permit. Pertinent well data is indicated on Table 1.

The Town of Wallkill currently is conducting an investigation into the installation of two additional production wells, one at the Kosuga well field and a second at the Crystal Run well field (Smith, 1993a). Additionally, as part of the Town's evaluation, all active Braeside wells will be considered for relocation upland and away from the Wallkill River. The benefits of this action may be increased well-yield capacities, decreased iron and manganese concentrations, and minimal influence from the Wallkill River to the ground-water supply.

Woodland Acres Water District

The Woodland Acres bedrock wells were originally developed as a small private community water supply system to service 27 detached residential units. In the late 1980s, the Town acquired ownership forming the Woodland Acres Water District (Smith, 1993a).

Well Supply in Service

The Town presently operates two wells (Wells 2 and 3) as supply to the Woodland Acres subdivision. Well 2 (GIM, Well WL-23) and Well 3 (GIM, Well WL-24), installed in 1965 and 1986, respectively, are both completed in the deep bedrock aquifer. Available well data and well-yield capacities are summarized in Tables 1 and 2B.

PROPOSED COMMUNITY WATER-SUPPLY SYSTEMS

Mr. Smith, Water Superintendent, indicates that there are no new community water-supply systems being proposed in the Town of Wallkill. There are several major subdivisions being planned for the future, however, these new subdivisions will be incorporated into the Wallkill Consolidated Water District. In lightly populated residential areas, it is likely individual water supply wells would be developed (Smith, 1993a).

WATER SUPPLY DEMAND

City of Middletown

The present surface water reservoir supply system meets the estimated average daily demand of 4.2 mgd and the estimated maximum daily water demand of 5.7 mgd (CH2M Hill, 1992) (Table 3A). The average and maximum yield capacities of the four reservoirs are estimated to be approximately 5.0 and 6.0 mgd, respectively.

Consolidated Water District

The present water supply system consists of six independent well fields that adequately service the estimated average daily water demand of 2.50 mgd, as well as the recently recorded peak summer demand of 3.55 mgd. Since the Crystal Run, Kosuga, and Braeside well fields supply the majority of water to the system, a loss of service of one or any combination of these well fields would jeopardize the system's ability to meet the demand. Table 3B summarizes the well supply data.

Woodland Acres Water District

The present supply (maximum-yield capacity of 17,000 gpd by the two wells) exceeds the estimated average daily water demand of 7,500 gpd and the estimated maximum daily demand of 15,000 gpd. However, a loss of service from either one of the two wells would result in an insufficient water supply.

Projected Water Demands

City of Middletown

The existing and proposed City of Middletown

reservoir water supply system has a projected maximum yield capacity of approximately 10 mgd (Table 4A). The projected water demand for the City at the year 2020 is estimated to be approximately 5.84 mgd; thus, at the year 2020, the City of Middletown will likely have a substantial water supply surplus, estimated to be approximately 4.16 mgd. Mr. Johnson indicates that the City is not likely to pursue further development of potential ground-water supply in the Wawayanda area due to the potential cost (Johnson, 1993b).

Town of Wallkill

Presently, the maximum-yield capacity of the Consolidated Water District Number 1 is 3.60 mgd. Combining the proposed sources would result in a total maximum-yield capacity estimated at 5.50 mgd. The projected water demand for the year 2020 is estimated at 5.1 mgd (Table 4B) (Smith, 1993). Calculating maximum demand based on 1.5 times the average daily demand indicates 7.65 mgd maximum yield will be required by the year 2020. In this case, both the average and the maximum projected water demands will exceed the supply. Table 4B summarizes the projected water demand.

The Woodland Acres Water District is too far away to contribute to the water demand of Water District Number 1.

The projected average water demand for the Town by the year 2020 is likely to reach 5.1 mgd (Smith, 1993). Mr. Smith indicates that to accommodate the projected demand, the Town expects to pursue several alternatives. One of these alternatives is to evaluate the feasibility of installing two additional high-yield production wells, one at the Kosuga well field and one at the Crystal Run well field. Additionally, a water-taking permit will be pursued for the high-yield production wells installed at the Echo Lake site during 1989, but which have not yet been put into production. Finally, the Town will further investigate the development of a well field east of Bart Bull Road adjacent to the Wallkill River.

INVENTORY OF GROUND-WATER CONTAMINATION

Existing Ground-Water Contamination Problems

EA has reviewed the inventory of solid waste facilities, spills, NYSDEC Registered Inactive Hazardous Disposal sites, active spill recovery remediation installations, and RCRA sites for the Town of Wallkill. The information was obtained from NYSDEC through the Freedom of Information Law (FOIL) and provided to EA by Lawler, Matusky and Skelly Engineers (LMS, 1993). The inventory of sites which are known to have contaminated ground water within the Town of Wallkill are presented below.

Registered Inactive Hazardous Waste Disposal Sites

The following description information was obtained from the Division of Hazardous Waste Remediation Inactive Hazardous Waste Disposal Reports (NYSDEC, 1993a,b,c,d):

Wallkill Town Landfill

Inactive municipal landfill. Hazardous waste disposal has been confirmed, including industrial drums containing flammable materials, still bottom residue with smaller amounts of waste solvents, and battery recycling products. Leachate is present at the site, and soils and ground water have been contaminated with heavy metals and volatile organic compounds. No ground-water contamination has been detected in nearby private wells. A NYSDEC Consent Order has been signed; remediation will include excavation of stream banks, Part 360 capping of the existing landfill, long-term monitoring and maintenance, as well as a contingency plan for ground-water collection and treatment. Site is located north of Middletown at the intersection of Tarbell and Banke roads.

Middletown Dump

A former incinerator and landfill for municipal and commercial waste. Hazardous waste including benzene, toluene, ethanol, methanol, waste oil, and still bottom residues were incinerated, and the resulting ash was buried in the landfill. Additional hazardous wastes were buried directly into the landfill. The site presently receives construction and demolition debris from various Town maintenance activities. There is the potential for ground-water, soil, and surface water contamination due to leaching of material from the landfill. Surface water/sediment samples and a surface soil sample collected at the base of the landfill do not indicate any significant contamination. Sampling in nearby private wells indicates the presence of secondary inorganic

contaminants, however at concentrations considered not to pose a health hazard. A Preliminary Site Assessment is in progress. The site is located east of Dolson Avenue and north of Dolsontown Road in the southeast corner of the City of Middletown.

Lubricant Packaging Company

Former facility for degreasing and relubrication of bearings used 1,1,1-trichloroethane and mineral spirits. Waste oil was also handled at the site. Improper storage of hazardous wastes resulted in extensive soil contamination. A NYSDEC Consent Order has been signed for a responsible party Phase II investigation. The site at 17 Industrial Place is located within an industrial area situated between Highland Avenue Extension and the Conrail railroad tracks in the northeast corner of the City of Middletown.

Highland Avenue - Wallkill (General Switch)

An open dump at the General Switch Facility where hazardous waste containing tetrachloroethylene (perchloroethylene [PCE]) was disposed of in the past. Ground-water contamination with PCE has been confirmed. Effected private wells have been connected to the municipal water supply. An EPA Consent Order has been signed for remediation at the site. Remediation will include a pump and treat system for ground water, removal of contaminated soil, and a soil flushing system.

Active Spill Recovery

Eustance & Horowitz, P.C.

A petroleum leak from an underground storage tank resulted in soil and ground-water contamination (Hardy, 1993). The underground storage tank has been removed and contaminated soil surrounding the tank has been excavated and stockpiled at the site. A soil vapor extraction system is being used to treat the ground water, combined with treating water from a basement sump. Sampling in peripheral ground-water monitoring wells indicates low levels of contamination. NYSDEC anticipates a hydrogeologic study will be needed at the site. The site is located 0.25 mile southwest of the intersection of Goshen Turnpike and Route 302 in Circleville.

Lake's Deli

Former refueling station. Underground storage tanks were removed approximately 2 years ago and the surrounding soil was excavated to bedrock. Analysis of samples from ground-water monitoring wells detected benzene, toluene, ethylbenzene, and xylene. Vapor extraction unit has been installed at the site and is active (DeCicco, 1993). The site is located on the southwest corner of the intersection of Goshen Turnpike and Route 302 in Circleville.

Remedial action is pending for each of the registered inactive hazardous waste disposal sites. Each of these registered inactive hazardous waste sites and the two active spill recovery installation sites are indicated on the GIM.

Potential Ground-Water Contamination Problems

Information about potential ground-water contamination sites was obtained from:

- FOIL request to NYSDEC (LMS, 1993); and
- Land use data from the Orange County, New York Real Property Tax Assessment data base (Space Track, 1993).

The following is a summary of potential ground-water contamination sites inventoried by NYSDEC and provided to EA by Lawler, Matusky and Skelly Engineers. The locations of solid waste facilities are indicated on the GIM.

Solid Waste Facilities

- **Crystal Run C&D Disposal Site**

  In 1989, the owner applied to NYSDEC for a permit to operate a new C&D facility; however, according to NYSDEC records a permit was never issued and the plans were apparently abandoned (Metha, 1993). No other specific information regarding this site available (Metha, 1993; Smith, 1993b).

- **Labagh Property C&D Disposal Site**

  Inactive private facility which received C&D materials. NYSDEC has approved a 2-foot closure cap for the facility (Metha, 1993). Remedial construction is pending. The site is located to the east of Route 17M, just north of its intersection with Maples Road in Rockville.

Each property in Orange County has a land use code number. Properties with land use code numbers associated with potential contamination of ground water were identified through analysis of the Real

Property Tax Assessment data base by Space Track, Inc. The types of land uses in the potential contamination category include:

- industrial facilities;
- gas stations;
- dry cleaners, and
- auto repair facilities.

Where possible, approximate locations of these sites are shown as triangles on the GIM.

Petroleum Bulk Storage Facilities

The FOIL request from NYSDEC inventoried the petroleum bulk storage facilities presented on Table 5.

The above sites are listed as potential ground-water contamination sites located within the Town of Wallkill. Further investigations would be required to determine if contamination exists at the respective locations.

In addition to these sites, two registered inactive hazardous waste disposal sites located in the Town of Goshen, the Al Turi Landfill and the Orange County Landfill (Hudson Engineering, 1993), are located in close proximity to well fields developed in the sand and gravel aquifers in the Wallkill River Valley, and could potentially affect the quality of ground-water within the area of these well fields.

TABLE 1

TOWN OF WALLKILL

Summary of Available Well Data

Well --- Water District	Tax Map Municipality --- Section --- Block --- Lot	Map Location --- I.D. #	Well Status	Reported Yield (gpm) Original --- Present	Depth of Well (feet)	Well Diameter (inches)	Length of Casing (feet)	Well Screen Length (feet) --- Setting Interval (feet)	Aquifer	Date Drilled	Comments
Scotswood Well 1 --- Consolidated	Wallkill 42 --- 4 --- 2.1	Wallkill Plate 1B --- WL-1	In service --- Active	NA --- 27	25	24	NA		Shale bedrock On	1967	
Scotswood Well 2 --- Consolidated	Wallkill 42 --- 4 --- 2.1	Wallkill Plate 1B --- WL-2	In service --- Active	100 --- 27	25	24	NA		Shale bedrock On	1967	Original combined yield for Scotswood Wells 1 and 2
Scotchtown Well 1 --- Consolidated	Wallkill 43 --- 3 --- 3	Wallkill Plate 1B --- WL-3A	Abandoned	NA	NA	NA	NA	NA	NA	NA	
Scotchtown Well 2 --- Consolidated	Wallkill 43 --- 3 --- 3	Wallkill Plate 1B --- WL-3B	Abandoned	NA	NA	NA	NA	NA	NA	NA	
Scotchtown Well 3 --- Consolidated	Wallkill 43 --- 3 --- 3	Wallkill Plate 1B --- WL-3C	Abandoned	NA	NA	NA	NA	NA	NA	NA	
Scotchtown Well 4 --- Consolidated	Wallkill 43 --- 3 --- 3	Wallkill Plate 1B --- WL-3	In service --- Active	100 --- 27	115	6	51.6		Shale bedrock On	1960	Original combined yield

TABLE 1
(continued)

TOWN OF WALLKILL

Summary of Available Well Data

Well --- Water District	Tax Map Municipal-ity --- Section --- Block --- Lot	Map Location --- I.D. #	Well Status	Reported Yield (gpm) Original --- Present	Depth of Well (feet)	Well Diameter (inches)	Length of Casing (feet)	Well Screen Length (feet) --- Setting Interval (feet)	Aquifer	Date Drilled	Comments
Braeside Well 1 --- Consolidated	Wallkill 78 -- 1 -- 41	Wallkill Plate 1B --- WL-4	In service --- Active	266 --- 122	24.6	8	19.0	5.6 ---	Uncon. sediment	1973	
Braeside Well 2 --- Consolidated	Wallkill 78 --- 1 --- 41	Wallkill Plate 1B --- WL-5	In service --- Active	260 --- 128	23.8	8	18.2	5.6 ---	Uncon. sediment	1973	
Braeside Well 3 --- Consolidated	Wallkill 78 --- 1 --- 41	Wallkill Plate 1B --- WL-6	In service --- Active	262 --- 96	21.4	8	15.8	5.6 ---	Uncon. sediment	1973	
Braeside Well 4 --- Consolidated	Wallkill 78 --- 1 --- 41	Wallkill Plate 1B --- WL-7	In service --- Active	254 --- 112	26.2	8	20.6	5.6 ---	Uncon. sediment	1973	
Braeside Well 5 --- Consolidated	Wallkill 78 --- 1 --- 41	Wallkill Plate 1B --- WL-8	Abandoned	NA	22.0	8	16.4	5.6 ---	Uncon. sediment		High iron and manganese - low yield

TABLE 1
(continued)

TOWN OF WALLKILL

Summary of Available Well Data

Well --- Water District	Tax Map Municipal-ity --- Section --- Block --- Lot	Map Location --- I.D. #	Well Status	Reported Yield (gpm) Original --- Present	Depth of Well (feet)	Well Diameter (inches)	Length of Casing (feet)	Well Screen Length (feet) --- Setting Interval (feet)	Aquifer	Date Drilled	Comments
Braeside Well 6 --- Consolidated	Wallkill 78 --- 1 --- 41	Wallkill Plate 1B --- WL-9	Abandoned	NA	19.4	8	13.8	5.6 ---	Uncon. Sediment	1973	High iron and manganese - low yield
Braeside Well 7 --- Consolidated	Wallkill 78 --- 1 --- 41	Wallkill Plate 1B --- WL-10	Abandoned	NA	21.7	8	16.1	5.6 ---	Uncon. sediment	1973	High iron and manganese - low yield
Braeside Well 8 --- Consolidated	Wallkill 78 --- 1 --- 41	Wallkill Plate 1B --- WL-11	In service --- Active	160 --- 96		12			Uncon. sediment	1974	
Braeside Well 9 --- Conslidated	Wallkill 78 --- 1 --- 41	Wallkill Plate 1B --- WL-12	In service --- Active	207 --- 96		12			Uncon. sediment	1974	Present combined yield for Braeside Wells 1, 2, 3, 4, 8, and 9 not to exceed 650 gpm

TABLE 1
(continued)

TOWN OF WALLKILL

Summary of Available Well Data

Well Water District	Tax Map Municipality Section Block Lot	Map Location I.D. #	Well Status	Reported Yield (gpm) Original Present	Depth of Well (feet)	Well Diameter (inches)	Length of Casing (feet)	Well Screen Length (feet) Setting Interval (feet)	Aquifer	Date Drilled	Comments
Kischel Well 1 Consolidated	Wallkill 78 1 21	Wallkill Plate 1B WL-13	In service Active	30 25	24	6	12	10 14-24	Uncon. sediment	1970	
Kischel Well 2 Consolidated	Wallkill 78 1 21	Wallkill Plate 1B WL-14	In service Active	30 25	24	6	12	10 14-24	Uncon. sediment	1970	
Kischel Well 3 Consolidated	Wallkill 78 1 21	Wallkill Plate 1B WL-15	In service Active	30 25	24	6	12	10 14-24	Uncon. sediment	1970	
Kischel Well 4 Consolidated	Wallkill 78 1 21	Wallkill Plate 1B WL-16	In service Active	30 25	24	6	12	10 14-24	Uncon. sediment	1970	Kischel Wells 1-4: Original combined yield capacity of 125 gpm. Present combined yield capacity of 100 gpm

TABLE 1
(continued)

TOWN OF WALLKILL

Summary of Available Well Data

Well Water District	Tax Map Municipality Section Block Lot	Map Location I.D. #	Well Status	Reported Yield (gpm) Original Present	Depth of Well (feet)	Well Diameter (inches)	Length of Casing (feet)	Well Screen Length (feet) Setting Interval (feet)	Aquifer	Date Drilled	Comments
Kosuga Well 1 Consolidated	Wallkill 73 1 31.1	Wallkill Plate 1B WL-17	In service Active	250 400	34	16	27	7.7	Uncon. sediment	1977	
Kosuga Well 2 Consolidated	Wallkill 73 1 31.1	Wallkill Plate 1B WL-18	Abandoned	250	39	16	29.5	9.5	Uncon. sediment	1975	Failed to re-cover from acid treatment
Kosuga Well 3 Consolidated	Wallkill 73 1 31.1	Wallkill Plate 1B WL-19	In service Active	250 130	42.3	16	40.3	3.7	Uncon. sediment	1977	
Kosuga Well 4 Consolidated	Wallkill 73 1 31.1	Wallkill Plate 1B WL-20	In service Active	250 400	36	16	26	10	Uncon. sediment	1988	Present combined yield of Kosuga Wells 1, 3, and 4 not to exceed 700 gpm

TABLE 1
(continued)

TOWN OF WALLKILL

Summary of Available Well Data

Well Water District	Tax Map Municipality Section Block Lot	Map Location I.D. #	Well Status	Reported Yield (gpm) Original Present	Depth of Well (feet)	Well Diameter (inches)	Length of Casing (feet)	Well Screen Length (feet) Setting Interval (feet)	Aquifer	Date Drilled	Comments
Crystal Run Well 1 Consolidated	Wallkill 60 1 69	Wallkill Plate 1B WL-21	In service Active	— 775	53.2	16	33	20.2 33-53.2	Uncon. sediment	1985	
Crystal Run Well 2 Consolidated	Wallkill 60 1 69	Wallkill Plate 1B WL-22	In service Active	— 800	49.0	16	30	19 30-49	Uncon. sediment	1985	Present combined yield of Crystal Run Wells 1 and 2 not to exceed 1,300 gpm
Woodland Acres Well 2 Woodland	Wallkill 14 2 39	Wallkill Plate 1A WL-23	In service Active		135	6	13		Bedrock On	1965	
Woodland Acres Well 3 Woodland	Wallkill 14 2 39	Wallkill Plate 1A WL-24	In service Active	— 10	423	6	32		Bedrock On	1986	

TABLE 1
(continued)

TOWN OF WALLKILL

Summary of Available Well Data

Well --- Water District	Tax Map Municipality --- Section --- Block --- Lot	Map Location --- I.D. #	Well Status	Reported Yield (gpm) Original --- Present	Depth of Well (feet)	Well Diameter (inches)	Length of Casing (feet)	Well Screen Length (feet) --- Setting Interval (feet)	Aquifer	Date Drilled	Comments
Echo Lake Well 1 --- Consolidated	Goshen 12 --- 1 --- 24.2	Goshen Plate 1 --- GT-36	Inactive --- Not equipped	370 ---	82.5	16	70	12.5 --- 70-82.5	Uncon. sediment	1989	
Echo Lake Well 2 --- Consolidated	Goshen 12 --- 1 --- 24.2	Goshen Plate 1 --- GT-37	Inactive --- Not equipped	115 ---	42	8	34	8 --- 34-42	Uncon. sediment	1989	Water-taking permit pending

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TABLE 2A

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
CONSOLIDATED WATER DISTRICT
ORANGE COUNTY, NEW YORK

Summary of Well-Yield Capacities

Well **Water District**	**WSA No.** **Permitted Yield (gpm)**	**Average Yield Capacity (gpm)** **(gpd)**	**Maximum Yield Capacity (gpm)** **(gpd)**	**Comments**
Scotchtown Estates Well 4 Consolidated	5403 100	25 36,000	27 38,880	
Scotswood Wells 1, 2 Consolidated	5403 100	43 61,920	54 77,760	
Kischel Wells 1, 2, 3, and 4 Consolidated	5875 200	40 57,600	100 144,000	
Braeside Wells 1, 2, 3,and 4 Consolidated	6031 800		458 659,520	
Braeside Wells 8,9 Consolidated	6476 350	788 1,134,720	192 276,480	Average yield capacity represents Braeside and Kosuga wells combined.
Kosuga Wells 1, 3, 4 Consolidated	6585 1,980		700 1,008,000	
Crystal Run Wells 1, 2 Consolidated	7700 1,600	840 1,209,600	1,300 1,872,000	
TOTALS	**(Total Permitted Yield)** **5,130 gpm** **7,387,200 gpd**	**(Total Yield Capacity)** **1,736 gpm** **2,500,000 gpd**	**(Total Maximum Yield Capacity)** **2,831 gpm** **4,076,640 gpd**	

gpm - Gallons per minute. WSA No. - Water Supply Application Number.
gpd - Gallons per day.

TABLE 2B

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
WOODLAND ACRES
ORANGE COUNTY, NEW YORK

Summary of Well-Yield Capacities

Well **-----** **Water District**	**WSA No.** **-----** **Permitted Yield** **(gpm)**	**Average Yield Capacity** **(gpm)** **-----** **(gpd)**	**Maximum Yield Capacity** **(gpm)** **-----** **(gpd)**	**Comments**
Woodland Acres Well 2 ---------- Woodland	3660 ------- 15	5.2 --------- 7,500	12 -------- 17,000	Developed as private community wells; acquired by Town WSA number to be issued Average and maximum yield capacities are for Wells 2 and 3 combined.
Woodland Acres Well 3 ---------- Woodland	NA -------- NA			
TOTALS	**(Total Permitted Yield)** **15 gpm** **21,600 gpd**	**(Total Yield Capacity)** **5.2 gpm** **7,500 gpd**	**(Total Maximum Yield Capacity)** **12 gpm** **17,000 gpd**	

gpm - Gallons per minute.
gpd - Gallons per day.

WSA No. - Water Supply Application Number.

TABLE 3B

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
CONSOLIDATED WATER DISTRICT
ORANGE COUNTY, NEW YORK

Summary of Water-Supply Source

The Town's consolidated water supply system is comprised of six independent production well fields. The majority of water supplied originates from the Kosuga, Braeside, and Crystal Run well fields, each installed within unconsolidated sediment aquifers adjacent to the Wallkill River.

Existing Sources

	Water District	Ground Water (mgd)
Current Average Daily Water Demand	Consolidated	2.50
Current Maximum Daily Water Demand	Consolidated	3.55
Maximum Yield Capacity	Consolidated	3.60
Average Yield Capacity	Consolidated	2.50
Proposed Sources (Average Day)		1.87
TOTAL MAXIMUM YIELD CAPACITY (MGD) = ---------- CURRENT MAXIMUM DAILY USE (MGD) =		5.47 ---------- 3.55

mgd - Million gallons per day.

COMMENTS

- The maximum daily water demand of 3.55 mgd occurred during the Summer of 1992
- Potential sources: One additional well at Crystal Run--0.72 mgd; one additional well at Kosuga--1.15 mg.
- System maximum-yield capacity adequately satisfies the current average and maximum daily water demand.

TABLE 3A

REGIONAL GROUND-WATER STUDY
CITY OF MIDDLETOWN
ORANGE COUNTY, NEW YORK

Summary of Water-Supply Source

The City of Middletown water supply system consists exclusively of four surface water reservoirs.

Existing Source

	Surface Water (mgd)	**Ground Water (mgd)**
Current Average Daily Water Demand	4.2	
Current Maximum Daily Water Demand	5.7	
Maximum Yield Capacity	6.0	
Average Yield Capacity	5.0	
Proposed Sources (Average Day)	4.0	
TOTAL MAXIMUM YIELD CAPACITY (MGD) = ---------- CURRENT MAXIMUM DAILY USE (MGD) =		10 ---------- 5.7

mgd - Million gallons per day.

COMMENTS

- Proposed surface water sources include: Increase existing reservoir levels (1 mgd) and develop Indigot Reservoir (3 mgd). Development of Indigot Reservoir may be difficult due to associated wetlands.

- The City of Middletown has previously examined the potential of ground-water development in the area of Wawayanda. Ground-water wells previously installed in the Wawayanda area have been tested and revealed insufficient yields to warrant costs associated with further aquifer development (Johnson 1993b).

TABLE 3C

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
WOODLAND ACRES WATER DISTRICT
ORANGE COUNTY, NEW YORK

Summary of Water-Supply Source

The Woodland Acres water supply system consists of two wells originally developed as a private community water supply.

Existing Sources

	Water District	**Ground Water (mgd)**
Current Average Daily Water Demand	Woodland Acres	0.007
Current Maximum Daily Water Demand	Woodland Acres	0.01
Maximum Yield Capacity	Woodland Acres	0.011
Average Yield Capacity	Woodland Acres	0.007
Proposed Sources (Average Day)		0.0
TOTAL MAXIMUM YIELD CAPACITY (MGD) = **----------** **CURRENT MAXIMUM DAILY USE (MGD) =**		0.017 **----------** 0.01

mgd - Million gallons per day.

COMMENTS

- System maximum-yield capacity adequately satisfies the current average and maximum daily water demand.

TABLE 4B

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Projected Water Demand
1993 - 2020
(mgd)

Water District	Current Maximum Yield Capacity (mgd)	Current and Proposed Maximum Yield Capacity (mgd)*	1993 Projected Water Demand (mgd) ----- Water-Supply Adequacy** (mgd)	2000 Projected Water Demand ----- Water-Supply Adequacy***	2010 Projected Water Demand ----- Water-Supply Adequacy***	2020 Projected Water Demand ----- Water-Supply Adequacy***
Wallkill 1/	3.60	5.47	2.50 --- +1.10**	3.10 --- +2.37***	4.10 --- +1.37***	5.10 --- +0.37***
TOTAL	3.60	5.47	2.50 --- +1.10**	3.10 --- +2.37***	4.10 --- +1.37***	5.1 --- +0.37***

1/ Consolidated and Woodland Acres water districts combined.
mgd - Million gallons per day.
* Combined yield capacity of both current and proposed water supply(s).
** Calculated by current maximum yield capacity minus projected water demands.
*** Calculated by current and proposed maximum yield capacity minus projected water demands.
\+ Surplus water supply (mgd).
\- Water supply deficiency (mgd).

COMMENTS:

- Projected water demand based on Town estimates.
- Current and proposed maximum yield capacity not likely to meet projected average water demand at the year 2020.

TABLE 4A

REGIONAL GROUND-WATER STUDY
CITY OF MIDDLETOWN
ORANGE COUNTY, NEW YORK

Projected Water Demand
1993 - 2020
(mgd)

Water District	Current Maximum Yield Capacity (mgd)	Current and Proposed Maximum Yield Capacity (mgd)*	1993 Projected Water Demand (mgd) ----- Water-Supply Adequacy** (mgd)	2000 Projected Water Demand ----- Water-Supply Adequacy***	2010 Projected Water Demand ----- Water-Supply Adequacy***	2020 Projected Water Demand ----- Water-Supply Adequacy***
Middletown	6.00	10.00	4.20 --------- +1.80**	5.12 -------- +4.88***	5.48 ------- +4.52***	5.84 --------- +4.16***
TOTAL	6.00	10.00	4.20 ---------- +1.80**	5.12 ---------- +4.88***	5.48 -------- +4.52***	5.84 ---------- +4.16***

mgd - Million gallons per day.
* Combined yield capacity of both current and proposed water supply(s).
** Calculated by current maximum yield capacity minus projected water demands.
*** Calculated by current and proposed maximum yield capacity minus projected water demands.
\+ Surplus water supply (mgd).
\- Water supply deficiency (mgd).

COMMENTS:

- Projected water demand based on high case water demand presented within the revenue bond feasibility study prepared by CH2M Hill (1992).
- Current and proposed maximum yield capacity likely to exceed projected average water demand up to the year 2020.

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
Kara Petro Corporation	Route 17K	Bloomingburg
Circleville Elementary School	Route 302	Circleville
Circleville Middle School	Route 302	Circleville
Eustance & Horowitz	Route 302	Circleville
Lake's of Circleville, Inc.	Route 302	Circleville
Mikes Quickway Auto	P.O. Box 98, Route 302 17	Circleville
Sam E. Fast & Son, Inc.	Route 302	Circleville
Stonehenge Farm	Townley Lane	Circleville
Exit 118 Exxon No. 7503	Route 17 and Brown Road	Fair Oaks
M.C.M. Properties, Inc.	Box 119A	Fair Oaks
Howells Fire House	Elm Street	Howells
Perry Seamans Auto	270 East Main Street	Middletown
Academy Avenue Xtra Mart	88-90 Academy Avenue	Middletown
Agway Energy Products	295 North Street	Middletown
Agway Energy Products	638 North Street	Middletown
Agway Fertilizer Plant	69 1/2 Dolson Avenue	Middletown

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
Atwoods Service Center	20 Academy Avenue	Middletown
Bank of New York	135 North Street	Middletown
Behreut's Mobil Station	471 North Street	Middletown
Bergen Brunswig Drug Company	20-24 Union Street	Middletown
Board of Education	223 Wisner Avenue	Middletown
Bowser Greenhouses, Inc.	R.D. 7, Box 988	Middletown
Cambridge Manor	810 Stonridge Road	Middletown
Citgo Quik Mart	12th 17M Dolson Avenue	Middletown
Continental Baking Company	140 Dolson Avenue	Middletown
Convenient Food Mart 8282	Route 211	Middletown

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
Crystal Run S/S No. 7508	Route 17 and Crystal Run Road	Middletown
Cumberland Farms No. 3165	458 East Main Street	Middletown
Cumberland Farms No. 3167	West Main and Monhagen Avenue	Middletown
Cumberland Farms No. 3195	251 Highland Avenue	Middletown
D.P.W. Street Garage	68 Monhagen Avenue	Middletown
D.R.J. Autotech Corporation	125 West Main Street	Middletown
Dairy Mart No. 6683	35 Industrial Drive	Middletown
Dairy Mart No. 6694	16-18 County Line Road Route 78	Middletown
Dana Distributors, Inc.	Route 211 East and Bull Road	Middletown
David Moore Heights Apartments	116-138 Genung Street	Middletown
Davis Motors, Inc.	R.D. 3, Route 17M, Box 305	Middletown
E.A. Morse and Company, Inc.	11-25 Harding Street	Middletown
E. Tetz and Sons, Inc.	R.D. 2, Box 65, Crystal Run Road	Middletown
Fairlawn Sunoco	1-3 Fairlawn Avenue	Middletown
Fieldvine, Inc.	50-58 Fulton Street	Middletown
First Presbyterian Church	25 Orchard Street	Middletown

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
Fulton Chevrolet-Cadillac Company	Route 17M and I-84, P.O. Box 519	Middletown
Fulton Plaza	33 Fulton Street	Middletown
Galleria Sunoco	530 Route 211 East	Middletown
Genpak Corporation	Republic Plaza	Middletown
Getty	700 Route 211	Middletown
Gilmans Cleaners, Inc.	40 Dolson Avenue	Middletown
Greenwood Packing Corporation	10 Oliver Street	Middletown
GTE New York	John Street	Middletown

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
H.L. Ayres, Inc.	503 North Street	Middletown
Herco Distributing Corporation	29 Dolson Avenue	Middletown
Hess Station 32295	151 Wisner Avenue	Middletown
Hess Station 32302	154 Dolson Avenue	Middletown
Horton Memorial Hospital	60 Prospect Avenue	Middletown
Howard Johnson Lodge	551 Route 211 East	Middletown
Hudson Delaware Council, Boy Scouts of America	21 Orchard Street	Middletown
Industrial Place	50 Industrial Place	Middletown
International Paper Company	Tower and Industrial Drive	Middletown
Inwood Hills	Inwood Road	Middletown
Kaerner Buick-Pontiac-Olds, Inc.	45 Fulton Street	Middletown
Kieley and Mueller Division	64 Genung Street	Middletown
Kornish Distributors, Inc.	672 Route 211 East	Middletown
Leo's Maple Service Station	R.D. 3, Route 17M/Box 81	Middletown
Leonard E. Hulseapple	R.D. 7, Box 493 Derby Road	Middletown
Lloyd's Gas and Service Centers	330 Route 211 East	Middletown

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
M. Spiegel and Sons Oil Corporation, D/B/A/ Lupac	75 Wisner Avenue	Middletown
Main Street Auto	176 West Main Street	Middletown
Mario's Service	157 Wickham Avenue	Middletown
Martine's Service Center	487 Route 211 East	Middletown
Mid-City Transit Corporation	518 North Street	Middletown
Middletown ATI No. 307	210 Wickham Avenue	Middletown
Middletown Footwear, Inc.	39 Railroad Avenue	Middletown

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
Middletown Honda	21 Fulton Street	Middletown
Middeletown Insta Mart	234 Wickham Avenue, Route 211	Middletown
Middletown Operating Center	71 Dolson Avenue	Middletown
Middletown Psychiatric Center	141 Monhagen Avenue	Middletown
Mobil Oil S/S 06-LK7	Route 17 and Crystal Run Road	Middletown
Mobil S/S/ 06K3A	Route 17M and Brown Road	Middletown
Mobil S/S 06KQ5	290 Route 211 East	Middletown
Monhagen Service Center	178 Monhagen Avenue	Middletown
New Vernon Florist, Inc.	R.D. 5, Box 234	Middletown
New Vernon Marine, Inc.	R.D. 4, Box 17A	Middletown
New York State Police	Troop F Crystal Run Road	Middletown
New York State Thruway Authority	Route 6	Middletown
North End Garage	484 North Street	Middletown
North Street Mobil	475 North Street	Middletown
NYSDOT	Route 6	Middletown
Orange County Plumbing Supply Company	34 Cottage Street	Middletown

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
Orange County Cablevision	Industrial Drive	Middletown
Orange County Community College	115 South Street	Middletown
Orange County Corrugated, Inc.	Industrial Place, P.O. Box 518	Middletown
Orange County Rehab Center Occup	70 Fortune Road West	Middletown
Our Lady of Mt. Carmel Church	90 Euclid Avenue	Middletown
PFW-Fries, Inc.	10 Sprague Avenue	Middletown
PFW-Fries, Inc.	33 Sprague Avenue	Middletown
Playtog's Factory Outlet Inc.	Dolson Avenue Extension	Middletown

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
Princeton Upholstery Company, Inc.	51 Railroad Avenue	Middletown
RAL Corporation	24 Dunning Road	Middletown
RAL Corporation	24 Dunning Road	Middletown
Randall Airport	Airport Road	Middletown
Rent-All Center	R.D. 4, Box 51, Route 6	Middletown
Revere Smelting and Revining/NJ	R.D. 2, Ballard Road	Middletown
Reynolds Metals Comapny	R.D. 2, Gallard Road	Middletown
Rowley Building Products Corporation	R.D. 6, 15 Golf Links Road	Middletown
Rowley Building Products Corporation	307 North Street	Middletown
Sam E. Fast & Son, Inc.	28-32 Sands Station Road	Middletown
Silver Lake Apartments	Silver Lake Road	Middletown
South East Towers	55 Fulton Street	Middletown
Southwinds Retirement Home, Inc.	27 South Street	Middletown
SPC Petrol	76 East Main Street	Middletown
SPI Petroleum Corpation, Inc.	28-34 Dolson Avenue	Middletown
Stewart's Shop No. 327	333 Tower Drive	Middletown

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
Stroehmann Bakeries, Inc.	435 East Main Street	Middletown
Super Value	Route 17 and Dolsontown Road	Middletown
Tesa Tuck, Inc.	Crotty Road	Middletown
Tetz Sand and Gravel, Inc.	R.D. 2, Box 65, Crystal Run Road	Middletown
The Times Herald-Record	40 Mulberry Street	Middletown
Town Highway Garage	Route 302 and Route 17M	Middletown
Town of Wallkill Wastewater Treatment	Box 398	Middletown
Turnpike Super Service, Inc.	495 North Street	Middletown

TABLE 5

REGIONAL GROUND-WATER STUDY
TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

Petroleum Bulk Storage Facilities

Facility Name	Location	Municipality
U-Haul Center of Middletown	333 Route 211 East	Middletown
Wakefern Food Corporation	Ballard Road, R.D. 2, Box 11	Middletown
Wallace Oil Company, Inc.	10 Sands Station Road	Middletown
Wally Mart Mobil	107-111 Dolson Avenue	Middletown
Walters Gulf Service Center	R.D. 4 Box 28, Route 17M	Middletown
Wehran Engineering, P.C.	666 East Main Street	Middletown
Wickham Avenue Exxon	235 Wickham Avenue	Middletown
Wilson Field Exxon	Route 17M South	Middletown
Winghoff Associates	South Plank Road (R.D. 4, Box 194)	Middletown
Fini Brothers	15 Fini Drive	Wallkill
Howard's Express Inc.	681 Route 211 East	Wallkill
Inwood Hills Cond. Association	Inwood Road	Wallkill
Jiffy Lube	Route 211 and Carpenter Avenue	Wallkill
Leptondale Elementary School	Mill Street	Wallkill
WCC Tank Technology	481 Route 300	Wallkill