Appendix 5

Wastewater Treatment Report/Water Facilities Report

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WASTEWATER FACILITIES REPORT

HIGHGATE / WOODLANDS DEVELOPMENT

REED ROAD

TOWN OF NORTH SALEM

WESTCHESTER COUNTY, NEW YORK

MAY 1, 2004

REV. JULY 12, 2004

REV. AUGUST 12, 2004

REV. OCTOBER 15, 2005

REV. MAY 7, 2010

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A. DESCRIPTION OF PROPOSED DEVELOPMENT

The applicant, Joflo of North Salem Inc., proposes to construct a housing development of 42 single family homes and 76 senior age designed multi-family residences, both of which will require the construction of a sewage treatment plant to treat the sewage generated. The development will occur on a vacant parcel of land bounded by Reed Road on the east, the Town of Southeast to the west and Sun Valley Drive to the south. Road access will occur from Reed Road with a cross slope private road running from north to south. Reed Road is a Town Road that has access to Hardscrabble Road on the south. The current owner of the land is Joflo of North Salem Inc., and the corporation and/or its successors in interest will be responsible for the construction and operation of the sewage treatment facility.

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B. REQUIRED APPROVALS

Joflo of North Salem Inc. will apply for a New York State SPDES permit from the New York State Department of Environmental Conservation and also secure approval for the facility from the New York City Department of Environmental Protection (NYCDEP). This SPDES permit will contain specified parameters with regard to quantity and quality of effluent flow which is discharged. The plant will be operated in conformance with the permit requirement; this would include routine testing according to a specified schedule, with monthly reporting to the requisite government agencies.

With respect to the design of the sewage treatment facilities, the Westchester Department of Health and NYCDEP play an active role in reviewing the design. Each agency will review the wastewater facility report and the detailed design drawings and approve same. The review will include an analysis of the capabilities of the proposed sewage treatment plant and the construction details to ensure the plant will yield a quality effluent product.

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C. HYDROLOGY

The property contains two intermittent streams and one perennial stream. Intermittent stream one runs South to North in the Midwestern portion of property. Intermittent stream two runs North to South toward pond. The perennial stream runs from west to East in the front of the property. As noted above, there will be a subsurface discharge to subsurface sewage disposal fields which will not adversely affect the quality of surface waters.

D. OPERATOR

The waste water treatment facilities must be operated by a licensed New York State Sewage Treatment Plant Operator. The Operator will be responsible for routine maintenance of all mechanical equipment and monitoring of the treatment plant processes. An independent laboratory will be under contract to provide monthly testing data to insure the plant is in compliance with the effluent parameters specified in the SPDES permit.

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E. DESCRIPTION OF TREATMENT PROCESS UNITS

1. PRIMARY SETTLING

Primary settling tank(s) will be installed at the influent end of the plant. The purpose of the primary settling process is to allow the solids in the sewage effluent to settle via gravity to the bottom of the tank. Reinforced concrete tanks will be sized in sufficient volume to allow a detention period in conformance with all pertinent regulations. There will be additional volume for the storage of sludge. Sludge will be removed from the site and processed by an approved facility.

2. ROTATING BIOLOGICAL CONTACTOR

Rotating biological contactors will be utilized in order to achieve sufficient biological oxygen demand reduction and ammonia nitrogen removal. The disc will be placed in a reinforced concrete compartmentalized tank. A building will be constructed over the disc and heated to maintain a consistent 55 degrees Fahrenheit temperature in all weather conditions. The reason for the application of heat is that the degree of biological treatment diminishes severely when the temperature falls below 50 degrees Fahrenheit.

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3. SECONDARY CLARIFIER

A solids contact clarifier will be utilized for secondary treatment and liquid alum could be injected to a center settling cone which will provide for the removal of phosphorous. The settleable solids will be given the opportunity to settle via gravity, with the sludge collected at the bottom of the tank.

4. RAPID SAND FILTRATION

Depending on the permit requirements, dual rapid sand filters will be utilized in order to provide tertiary treatment (polishing) of the effluent. The filters will be provided with automatic backwash capabilities, thus insuring proper operation at all times.

5. DISINFECTION

Proper disinfection will occur by utilization of ultra violet light. This process allows for a bacteria inactivation without producing a harmful effluent parameter such as chlorine residual.

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6. REAERATION

If required by the SPDES Permit, reaeration will occur in order to provide a supply of dissolved oxygen in sufficient quantity so that the aquatic life in the effluent will not experience a lack of oxygen. Typically, a reinforced concrete tank will be utilized with a diffuser pipe network, introducing air which contains a sufficient input of oxygen to reach a goal of 7 mg/1.

F. PLANT LOCATION

The location of the proposed sewage treatment is one of primary concern. It should be situated at a reasonable distance from any existing or proposed dwelling unit. Thus, in effect, a buffer will be provided for odor control and noise. It is for this reason that the treatment plant is located as shown on the wastewater parcel (see attached site plan.) in somewhat of the center of the property.

G. OWNERSHIP OF WASTEWATER FACILITIES

The waste water collection system and sewage treatment facility will be owned and operated by the Sewage Works

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Corporation as such the Town will not have any financial involvement.

H. COLLECTION SYSTEM

A separate central sanitary sewer collection system will be constructed to serve the project. The system will consist of plastic sewer piping and pre-cast sewer manholes and pumping stations. Generally, a maximum of 300 foot of sewer main will be constructed between manholes. In addition, manholes will be provided all changes or direction (vertical and horizontal). A comprehensive testing program will be implemented in order to ensure that no leakage will occur in excess of Health Department guidelines prior to placing said sewer in service.

H. FLOW IMPACT ON RECEIVING STREAM

Since this is pretreated subsurface discharge, there will be no adverse impact to the receiving stream or wetland.

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DESIGN CONSIDERATION

ADVANCED WASTEWATER TREATMENT PLANT

HIGHGATE / WOODLANDS PROJECT

TOWN OF NORTH SALEM

WESTCHESTER COUNTY, NEW YORK

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DESIGN PARAMETERS

SIZING OF TREATMENT UNITS

1. DESIGN FLOW

SINGLE FAMILY RESIDENCES

12-4BR HOMES, 2500 GSF @ 475 GPD

14-4BR HOMES, 3500 GSF @ 475 GPD

16, 5 BR HOMES, 4500 GSF @ 550 GPD

TOTAL PROJECTED FLOW

26 x 475 GPD/DWELLING = 12,350 GPD

16 x 550 GPD/DWELLING = 8,800 GPD

MULTI-FAMILY AGE RESTRICTED - OVER 55 POPULATION

28-1BR CONDOMINIUMS, 2600 GSF @ 200 GPD

48-2BR CONDOMINIUMS, 3000 GSF @ 300 GPD

TOTAL PROJECTED FLOW

28 X 200 GPD/UNIT = 5600 GPD

48 x 300 GPD/UNIT = 14400 GPD

ALL FIXTURES WILL BE WATER SAVING TYPE-YIELDING A 20% REDUCTION IN FLOW THEREFORE, THE PROJECT FLOW WILL BE:

(21,150 GPD + 20,000 GPD)(0.80)= 32,920 GPD

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FLOW CALCULATION

FOR THE PURPOSES OF DESIGN, ASSUME 33,000 GPD

AVERAGE DAILY FLOW = 33,000 GALLONS PER DAY = 23 GPM

AVERAGE HOURLY FLOW = 49,500 GALLONS PER DAY = 34 GPM

PEAK HOURLY FLOW = 123,750 GALLONS PER DAY = 86 GPM

2. RAW SEWAGE TREATMENT

BOD 5 = 200 mg/1

SS = 200 mg/1

NH 3 = 25 mg/1

P = 4 mg/1

O 2 = 0 mg/1

The above parameters have been used when designing waste water treatment facilities in the area. In actual plant operations, the raw strengths noted above are seldom experienced. This yields a very conservative design approach.

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3. PROJECTED EFFLUENT LIMITATIONS

(assuming no credit for subsurface discharge)

BOD 5	**= 5.0 mg/1**	**PH= 6.5 TO 7.5**
SS	**= 10.0**	**FECAL COLI = .200**
NH 3	**= 2.0 mg/1**	**CHLORINE RESIDUAL = 0.05 mg/1**
P	**= 1.0 mg/1**	**SETTLE SOLIDS = 0.10 mg/1**

4. SIZING OF PROCESS UNITS

The following calculations provide for the proper treatment of the wastewater that will be generated.

A. PRIMARY SETTLING

UTILIZE SEPTIC TANKS FOR PRIMARY SETTLING. DESIGN FOR DAILY FLOW PLUS STORAGE. USE 33,000 GALLON PROCESS FLOW + 8,000 SLUDGE TOTAL CAPACITY = 41,000 GALLONS. TOTAL CAPACITY = 4 x 12,000 =48,000 GALLON > 41,000 GAL

B. EQUALIZATION

EQUALIZE THE FLOW FOR 24 HOUR DELIVERY. UTILIZE 12,000 GALLON PUMP PIT WITH 25 GPM PUMPS.

C. ROTATING BIOLOGICAL CONTACTOR

SIZE FOR 33,000 GPD FOLLOWING SEPTIC TANK SEDIMENTATION. AERATE THE FIRST DISC CHAMBER TO PROVIDE AEROBIC

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ENVIRONMENT AFTER ANAEROBIC SEPTIC TANK ENVIRONMENT.

TEMPERATURE CORRECTION = 1.0 (55 DEGREES F)

BOD LOADING = 1.0 LB/1,000 SF/DAY

NITRIFICATION LOADING = 0.32 LB/1,000 SF/DAY

SEPTIC TANK FACTOR = 1.5

$$\text{MIN. AREA} = \frac{Q \times WS \times WC \times TB \times SI}{AR}$$

$$\text{A BO5} = \frac{0.033 \times 100 \times 8.34 \times 1.0 \times 1.5}{1}$$

= 41.3 KSF

$$\text{A B15} = \frac{0.033 \times 100 \times 8.34 \times 1.0 \times 1.5}{2}$$

= 20.6 KSF

$$\text{AN} = \frac{0.033 \times 25 \times 8.34 \times 1.0 \times 1.5}{0.32}$$

= 32.25 KSF

$$\text{ASTO} = \frac{0.033 \times 100 \times 1.0 \times 1.5}{2.5}$$

= 2.0 KSF

A REQD = 41.3 KSF + 20.6 KSF

= 62 KSF

USE CLOW MODEL F-77/88,000 SF EACH

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D. SECONDARY SETTLING

SIZE FOR 600 GPD/SF & 3 HRS. DETENTION

33,000 GPD/600 = 55 SF REQD

USE A KEENE SOUNDS CONTACT CLARIFIER 10'x 10' = 100 SF

PROVIDE A CENTER SETTLING CONE FOR THE ADDITION OF LIQUID ALUM TO PRECIPITATE PHOSPHOROUS.

ACTUAL LOADING = 33,000/120 = 275 GAL/SF

PROVIDE A SLUDGE RETURN PUMP WHICH WILL ALLOW RECIRCULATION OR DISCHARGE TO THE HEAD OF THE PLANT OR TO THE SLUDGE HOLDING TANK- OPERATOR MANUAL CONTROLLED.

E. SAND FILTRATION

RAPID SAND FILTRATION WILL BE PROVIDED AT A RATE OF 1.0 PPM/SF/AVG FLOW OR 3.0 GPM/SF @ peak.

23 GPM/1.0 **= 24 SF**

86 GPM/3.0 **= 29 SF**

USE TWO SAND FILTER UNITS EACH WITH A CAPACITY OF **25 SF** -EACH FILTER 5x5 COMPLETE WITH AUTOMATIC BACKWASH. (50 SF SUPPLIED)

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F. DISINFECTION

There is a limiting factor for the allowable level of chlorine level in the effluent of the plant discharge. Other methods of disinfection are considered such as ozone or ultra-violet light. For ultra-violet, dual units are required each with a capacity of treating 33,000 gpd = 23 gpm at an average daily flow. The disinfection will follow rapid sand filtration. The effluent quality should not a pose a problem as far as clarity of the water being treated. The plant will use two units manufactured by ultra-violet purification systems.

For ultra-violet, dual units are required each with a capacity of treating 33,000 gpd = 23 gpm at an average daily flow. The disinfection will follow rapid sand filtration. The effluent quality should not pose a problem as far as clarity of the water being treated. The plant will use two units manufactured by ultra-violet purification systems.

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G. POST AERATION

DESIGN 20 MINS. DETENTION @ AVG FLOW

23 X 48 = 1104 GALLONS - USE ONE 1200 GAL TANK

8' WIDE x 10' LONG x 10' DEEP = **6,000 GAL.**

EXCESS CAPACITY PROVIDES FOR BACKWASH WATER FOR THE RAPID SAND FILTERS.

DIFFUSED AIR REQD - DO 0 TO 7 mg/1D

4 # 02 = 60 #AIR/DAY = 700 CF/DAY

ASSUME 7% TRANSFER RATE = **27 CFM**

H. SLUDGE STORAGE

THE SEPTIC TANKS ARE SIZED FOR 1 DAY FLOW AND CONSEQUENTLY ARE SUFFICIENT IN SIZE TO ALLOW FOR PROPER SLUDGE STORAGE.

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I. PHOSPHOROUS REMOVAL

DESIGN 2 MOLES OF AL TO L MOLE P

P = 10 mg/1 P FINAL = 1mg/1

REMOVAL = 9 mg/1 = **9 ppm**

= 9 x 0.07 x 8.34

= 5.25 #/DAY

ADD ALUM AT 20 TO 1

20 x 2.25 #/DAY= 45 #/DAY

The above outline indicates that the plant will be designed and constructed in compliance with the government standards for waste treatment works.

J. SUBSURFACE DISCHARGE LEACHING SYSTEM

Design Flow = 33,000 gpd

Using an Application Rate of 1.2 gpd per square foot

Assuming a 25% reduction in Required Leaching Area as a result of Pre-Treatment, the Required Leaching Area
= 33,000 gpd / 1.2 gpd per sf x 0.75 = 20,625 sf

Using 4'-0" x 4'-0" Pre Cast Concrete Leaching Galley, with an effective width of 6'-0",Required Length of Galley System
= 20,625 sf / 8.67 sf of leaching area per lineal foot
= 2,380 lineal feet of galley required for primary System

Provide a reserve area of 50% as a result of Pre-Treatment
= 1,190 lineal feet of galley within reserve area.

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WATER FACILITIES REPORT

HIGHGATE-WOODLANDS DEVELOPMENT

REED ROAD

TOWN OF NORTH SALEM

WESTCHESTER COUNTY, NEW YORK

May 1, 2004
REV JULY 12, 2004
REV AUGUST 12, 2004
REV OCTOBER 15, 2005
REV MAY 7, 2010
REV December 27, 2012

A. DESCRIPTION OF PROPOSED DEVELOPMENT

The applicant, Joflo of North Salem Inc., proposes to construct a housing development of forty two single family homes and seventy six senior age designed multi-family residences, both of which will require the construction of a sewage treatment plant to treat the sewage generated. The development will occur on a 160 acre vacant parcel of land bounded by Reed Road on the East, the Town of Southeast to the West and Sun Valley Drive to the South. Road access will occur from Reed Road with a cross slope private road running from South to North. Reed Road is a Town Road that has access from Hardscrabble Road on the south. The current owner of the land is Joflo of North Salem Inc., and the corporation and/or its successors in interest will be responsible for the construction and operation of the sewage treatment facility.

B. REQUIRED APPROVALS

Joflo of North Salem Inc. will apply for and a New York State Water Taking Permit from the New York State Department of Environmental Conservation and also secure approval for the facility from the Westchester County Department of Health as permitting agent for the New York State Dept. of Health. The permit will contain specified parameters with regard to quality of potable water that can be taken from the groundwater in New York State. The plant will be operated in conformance with the permit requirement; this would include routine testing according to a specified schedule, with monthly reporting to the requisite government agencies. With respect to the design of the water treatment facilities, the Westchester County Department of Health will play the most active roll in reviewing the design. The agency will review the water facility report and the detailed design drawings and approve same.

C. HYDROLOGY

The property contains two intermittent streams and one perennial stream. Intermittent stream one runs South to North in the Midwestern portion of property. Intermittent stream two runs North to South toward pond. The perennial stream runs from west to East in the front of the property. As noted above, there will be a subsurface discharge to subsurface sewage disposal fields which will not adversely affect the quality of surface waters.

D. OPERATOR

The water treatment facilities must be operated by a licensed New York State Water Treatment Plant Operator. The Operator will be responsible for routine maintenance of all mechanical equipment and monitoring of the treatment plant processes. An independent laboratory will be, under contract, to provide monthly testing data to insure the plant is in compliance with the effluent parameters specified in the Water permit.

E. OWNERSHIP OF WATER FACILITIES

The waste water collection system and sewage treatment facility will be owned and operated by a Water Works Corporation with no financial burden on the own.

DESIGN CONSIDERATIONS

WATER TREATMENT PLANT

HIGHGATE-WOODLANDS DEVELOPMENT

REED ROAD

TOWN OF NORTH SALEM

WESTCHESTER COUNTY, NEW YORK

DESIGN PARAMETERS
SIZING OF TREATMENT UNITS

A. DESIGN FLOW

SINGLE FAMILY RESIDENCES

26 x 4 BEDROOMS/UNIT = 104 BEDROOMS
16 X 5 BEDROOMS/UNIT = 80 BEDROOMS
TOTAL = 184 BEDROOMS

26 (4) BEDROOM UNITS X 475 GPD/HOUSE = 12,350 GPD
16 (5) BEDROOM UNITS X 550 GPD/HOUSE = 8,800 GPD
TOTAL SINGLE FAMILY RESIDENCE FLOW = 21,150 GPD

MULTI-FAMILY AGE RESTRICTED - OVER 55 POPULATION

28 UNITS X 1 BEDROOMS/UNIT = 28 BEDROOMS
48 UNITS X 2 BEDROOMS/UNIT = 96 BEDROOMS
TOTAL = 124 BEDROOMS
28 (1) BEDROOM UNITS X 200 GPD/UNIT = 5,600 GPD
48 (2) BEDROOM UNITS X 300 GPD/UNIT = 14,400 GPD
TOTAL MULTI-FAMILY RESIDENCE FLOW = 20,000 GPD

ALL FIXTURES WILL BE WATER SAVING TYPE - YIELDING A MINIMUM 20% REDUCED FLOW;

THEREFORE, THE PROJECT DOMESTIC FLOW WILL BE:

(21,150 + 20,000)X 0.80 = 32,920, SAY 33,000 GPD
ADDITIONAL FLOW FOR LANDSCAPING OF 24,500 GPD
TOTAL FLOW = 57,500 GPD

B. TOTAL PROJECT FLOW CAPACITY = 57,500 GPD

FOR THE PURPOSES OF DESIGN, ASSUME 57,500 GPD.
AVERAGE DAILY FLOW = 57,500 GALLONS PER DAY = 40 GPM
AVERAGE HOURLY FLOW = 86,250 GALLONS PER DAY = 60 GPM
PEAK HOURLY FLOW = 215,625 GALLONS PER DAY = 150 GPM

The above parameters have been used when designing water treatment facilities in the area. In actual plant operations, the flow demands noted above are seldom experienced. This yields a very conservative design approach.

C. EXISTING PROVIDED WELL SUPPLY

WELL # 1 = 10 GPM
WELL # 2 = 30 GPM
WELL # 3 = 46 GPM
WELL # 4 = 65 GPM

TOTAL = 151 GPM

The system will be REQUIRED to provide two (2) times the average daily flow without considering the largest yielding well.

Required supply = 40 gpm x 2 = 80 gpm
Provided Supply = 10 gpm + 30 gpm + 46 gpm = 86 gpm
86 gpm is greater than 80 gpm; therefore ok

D. SOURCE DEVELOPMENT

(Refer to Well Logs By BOYD ARTISAN WELL COMPANY - ATTACHED).

The existing wells will supply the required amount of water. The sum of the well yields equals, 10 + 30 + 46 + 65 = 151 gpm which is 3.75 times the average daily demand of 40 gpm. With respect to construction standards for the wells, applicable governing regulations dictate the methods of construction and, further, said specifications are incorporated into the design drawings. In addition, a significant testing program has been completed in conformance with New York State Regulation Sub Part 5. (See attached)

E. STORAGE REQUIREMENTS

Subsurface constructed steel storage tank(s) will be provided sized for the quantity of 60,000 gallons, greater than the average daily demand of 57,500 gallons. Two - 30,000 gallon steel storage tanks will be constructed on reinforced concrete cradles. Well discharge lines will enter a pump house, where the water will be chlorinated and discharged to the storage tank. Access for cleaning and inspection will be made via locked steel manhole ports placed above the ground surface. To prevent surface water from entering the tanks, grading will be provided in such a manner so as to direct water away from the tank.

F. BOOSTER PUMPS

Dual alternating booster pumps will be provided in the pump house. Each pump will be designed to supply in excess of ten times the average daily demand. Therefore, in the event that one of the pumps becomes inoperable, the remaining pump will be able to supply sufficient water. Pressure gauges will be supplied on the pump discharge line so that pump efficiency can be monitored.

Required Booster Pump Sizing = 40 gpm x 10 = 400 gpm

G. DISINFECTION

A chlorinator will be supplied capable of pumping 0-20 gpd vs. 100 psi. In addition, a duplicate unit will be available in the event the initial chlorinator fails. Chlorine will be injected into the well lines prior to discharge into the storage tank for proper detention time.

SIZING CALCULATIONS:
Well cycle yield = 100 GPM
Running time = 60,000 / 100 = 600 MINUTES
ASSUME 0.5 mg/l Concentration
For 100 gpm @ 1.5 ppm = 0.00016 gal chlorine straight (max needs) 2.5% solution = 0.00128 gal/min of 12.5 % solution
with a 10 to 1 dilution = = 0.00128/ 0.1 = .0128 gpd of diluted

H. METERING

Each well will have its own 1-1/2" diameter water meter. This will allow the operator the capability of determining the output of each well. In addition, a control panel will be utilized which will give continuous read-out of the following:

1. STATIC WELL LEVEL
2. WATER PRESSURE
3. AIR PRESSURE
4. HAND, AUTOMATIC, AND OFF POSITIONS FOR ALL PUMPS
5. STORAGE TANK WATER LEVEL
6. NO FLOW CUT OUT FOR ALL PUMPS

I. EMERGENCY POWER

An emergency generator, complete with automatic transfer switch, will be housed in the water pump house. The generator will be sized to operate all submersible well pumps, booster pumps, chlorinator facilities, and lighting. Therefore, service will be insured in the event of power outage.

The exhaust from the generator will exit the building through the roof and sufficient ventilation louvers will be provided so that the propane engine can operate efficiently.

J. HEATING AND VENTILATION

Space heaters will be provided, in order to maintain a 50 degree Fahrenheit temperature, assuming 0 degrees Fahrenheit outside. In addition to the aforementioned louvers, an electrical exhaust fan will be provided adjacent to the chlorination facilities.

K. DISTRIBUTION SYSTEM

A central water main distribution system will be installed to serve the development. Significant design features will include:

1. PUSH JOINT PVC DISTRIBUTION PIPING
2. CONCRETE THRUST BLOCKS AT ALL BENDS
3. “LOOPING" OF MAINS WHENEVER FEASIBLE
4. ISOLATION VALVES FOR MAINTENANCE
5. BLOW OFFS HYDRANTS AT DEAD END LOCATIONS
6. VALVE BOXES TO GRADE FOR ALL VALVES
7. PRESSURE TESTING OF ALL MAINS
8. DISINFECTION OF ALL MAINS

L. WATER PLANT LOCATION

The water treatment plant will be located at the higher elevations of the site (the western portion) within the proposed site development area. This will benefit the system's capability of being disconnected in the event that a municipal supply becomes available or if the town asks the applicant to become part of the Croton Falls Public Water Supply. The pump house equipment will be designed to give 35 psi pressure at the maximum dwelling elevation.

M. OWNERSHIP OF THE WATER SYSTEM

The system which consists of the wells, the water pump house, and the distribution mains will be owned and operated by a Private Transportation Corporation. Said corporation will be formed under the laws of the State of New York. With private ownership, no burden will be added to the municipal services of the Town.

N. COMPLIANCE WITH PERMIT STANDARDS

The facilities outlined above will be constructed in full compliance with all applicable governing standards and they will be operated in compliance with all operational standards including regular testing and monitoring as described in public health laws.

O. EMERGENCY POWER OPERATIONS PROVISIONS

1) MULTIPLE WELLS RUNNING
2) DUAL BOOSTER PUMPS RUNNING
3) DUAL STORAGE TANKS MAINTAINING PROPER LEVEL
4) AIR COMPRESSORS
6) CONTROL & ALARM PANELS
7) AUTOMATIC TRANSFER SWITCH