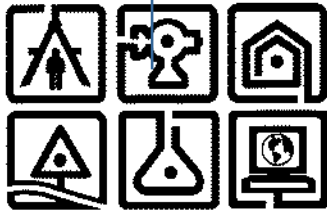


June 5, 2024

## Final Draft for Client Review



### Rensselaerville Water District Preliminary Engineering Report Town of Rensselaerville Albany County, New York

*Prepared for:*

Town of Rensselaerville  
87 Barger Road  
Medusa, New York 12120

*Prepared by:*

C.T. MALE ASSOCIATES  
50 Century Hill Drive  
Latham, New York 12110  
(518) 786-7400  
FAX (518) 786-7299

*C.T. Male Associates Project No: 24.4005*

Unauthorized alteration or addition to this document is a violation of the New York State Education Law.

© Copyright 2024

C.T. MALE ASSOCIATES ENGINEERING, SURVEYING, ARCHITECTURE, LANDSCAPE ARCHITECTURE & GEOLOGY, D.P.C.

**RENSELAERVILLE WATER DISTRICT  
PRELIMINARY ENGINEERING REPORT**

**TABLE OF CONTENTS**

	<b><u>Page</u></b>
1.0 Executive Summary.....	1
2.0 Project Background.....	2
2.1 Site Information.....	2
2.2 Ownership & Service Area.....	4
2.3 Existing Facilities.....	7
2.4 Need for Project.....	8
2.5 Capacity Development.....	10
3.0 Alternatives Analysis – Water Source & Treatment.....	10
3.1 Alternative 1 – New Groundwater Source.....	10
3.1.1 Description.....	10
3.1.2 Opinion of Probable Construction Cost.....	12
3.1.3 Non-Monetary Factors.....	13
3.2 Alternative 2 – Existing Surface Water Source (Ten Mile Creek) with New Treatment Facilities.....	13
3.2.1 Description.....	13
3.2.2 Opinion of Probable Construction Cost.....	14
3.2.3 Non-Monetary Factors.....	15
3.3 Alternative 2A – New Surface Water Source (Lake Myosotis) with New Treatment Facilities.....	16
3.3.1 Description.....	16
3.3.2 Opinion of Probable Construction Cost.....	16
3.3.3 Non-Monetary Factors.....	17
3.4 Alternative 3 – Individual Private Wells.....	18
3.4.1 Description.....	18
3.4.2 Opinion of Probable Construction Cost.....	18
3.4.3 Non-Monetary Factors.....	19
3.5 Alternative 4 – No Action.....	20
3.5.1 Description.....	20
4.0 Alternative Analysis – Water Storage Tank.....	20
4.1 Alternative 1 – Welded Carbon Steel Ground Storage Tank.....	21
4.1.1 Description.....	21

4.1.2	Opinion of Probable Construction Cost .....	21
4.1.3	Non-Monetary Factors .....	22
4.2	Alternative 2 - Cast-in-place Concrete Buried Storage Tank .....	22
4.2.1	Description .....	22
4.2.2	Opinion of Probable Construction Cost .....	22
4.2.3	Non-Monetary Factors .....	23
4.3	Alternative 3 - No Action .....	23
4.3.1	Description .....	23
4.3.2	Opinion of Probable Construction Cost .....	24
4.3.3	Non-Monetary Factors .....	24
5.0	Alternative Analysis - Methodist Hill Road Pump Station.....	24
5.1	Alternative 1 - New Pump Station.....	25
5.1.1	Description.....	25
5.1.2	Cost Estimate .....	25
5.1.3	Non-Monetary Factors .....	25
5.2	Alternative 2 - No Action .....	26
5.2.1	Description.....	26
6.0	Summary and Comparison of Alternatives .....	26
6.1	Water Source and Treatment.....	26
6.2	Water Storage Tank .....	28
6.3	Methodist Hill Road Pump Station .....	29
7.0	Recommend and Selected Alternatives .....	29
7.1	Water Source and Treatment.....	30
7.2	Water Storage Tank .....	30
7.3	Methodist Hill Road Pump Station .....	31
7.4	Debt Repayment.....	31

## **FIGURES**

Figure 1: Site Location Map

Figure 2: Project Location Map

Figure 3: Aerial Site Plan – Existing Water Treatment Plant

Figure 4: Aerial Site Plan – Alternative 1

Figure 5: Aerial Site Plan – Alternatives 2

Figure 6: Aerial Site Plan – Alternative 2A

## **APPENDICIES**

Appendix A – Site Information

Appendix A.1 – NRCS Web Soil Survey

Appendix A.2 – NYSDEC Environmental Resource Mapper

Appendix A.3 – National Flood Hazard Layer FIRMette

Appendix B – Existing System Information

Appendix B.1 – 1980 Distribution System Plans

Appendix B.2 – Existing Treatment Plant Process Flow Diagram

Appendix B.3 – Tank Inspection Report

Appendix B.4 – Hydrant Flow Test Results

Appendix B.5 – THM and HAA Data

Appendix B.6 – Public Notice of DOH Violations

Appendix C – Source Water Assessments

Appendix C.1 – Groundwater Source Water Assessment

Appendix C.2 – Surface Water Source Water Assessment

Appendix D – Capacity Development Program Evaluation Form

TO BE INCLUDED IN FINAL DRAFT

Appendix E – Smart Growth Assessment Form

TO BE INCLUDED IN FINAL DRAFT

Appendix F – Detailed Opinion of Probable Cost

Appendix G – Pall Corporation Membrane Filtration System

Appendix G.1 – Product Brochure

Appendix G.2 – AP 2 Skid Layout Drawing

## **1.0 EXECUTIVE SUMMARY**

The Rensselaerville Water District (Water District) has contracted C.T. Male Associates Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C. (C.T. Male) for engineering services and the preparation of a preliminary engineering report for a raw water source, treatment facility, and water storage for the municipal drinking water system.

This report will:

1. Summarize the findings of the engineering evaluation and assessment of alternative drinking water sources and their respective treatment requirements.
2. Summarize the findings of the engineering evaluation and assessment of alternative water storage options.
3. Present an analysis of the alternatives and comparison of costs.
4. Identify recommended actions that need to be taken for design and construction of the new drinking water source and treatment facility.
5. Identify recommended actions that need to be taken for design and construction of the new water storage tank.
6. Present the basis of design for the chosen alternative water source and associated treatment facility.
7. Present the basis of design for the chosen alternative water storage option.

## **2.0 PROJECT BACKGROUND**

The Rensselaerville Water District owns and maintains a treatment and distribution system to deliver drinking water to its customers in a portion of the Town of Rensselaerville (Town). The system, under Public Water Supply (PWS) ID# NY0100202, serves approximately 200 persons through 79 service connections. The 14,000 gallon per day (GPD) treatment plant, which withdraws water from the Ten Mile Creek, is located off Rice Road. The treatment process consists of a slow sand filter and a granular activated carbon (GAC) filter with chlorine disinfection before being fed to the system via approximately 5,100 linear feet (LF) of ductile iron water main. The water system also has a 50,000-gallon buried concrete water storage tank at the treatment plant, and a below-grade pump station on Methodist Hill Road. The water system supplies an average of 13,000 GPD to the customers of the Water District.

Historically, the Water District has had violations for disinfection by-products (TTHM and HAAs) concentrations and turbidity levels in excess of safe drinking water standards. The Water District has consulted with engineering firms in the past to address treatment deficiencies at their plant and raw water intake area. Recommendations, which have been implemented at various times, include, but are not limited to modifications in the slow sand filter, addition of a GAC tank, addition of permanganate dosing, increased hydrant flushing frequency and removal of a beaver dam upstream of the raw water intake. Despite implementation of the above noted recommendations, finished water continues to show MCL violations during some periods.

The Water District desires to have an engineering evaluation conducted to identify upgrades necessary to the water system to address these violations.

### **2.1 Site Information**

The Town of Rensselaerville is located in the southwest portion of Albany County, New York. A Site Location Map is included as Figure 1.

The Rensselaerville Water District water treatment plant and buried water storage tank are located at the south end of Rice Road. The Water District owns a small (4,825 square-foot) parcel off the private access road, approximately 340-feet south of Pond Hill Road.

A parcel being considered as an alternative water source is Tax Parcel 137.9-2-10.1 on Albany Hill Road, which is a 10.54 acre parcel owned by the Huyck Preserve. Any work relating to a proposed Water District-owned well field is located at this property.

The existing distribution system currently serves 79 customers along the roads of County Route 351, Delaware Turnpike, Methodist Hill Road, and Albany Hill Road. Any work relating to the proposed private wells includes all properties served by the distribution system. Historical design plans for distribution system improvements, dated 1980, are included in Appendix B.1.

A Project Location Map, detailing all proposed project locations, is included as Figure 2.

Existing soil information, including estimates for the depth of bedrock, for this report was obtained utilizing the United States Department of Agriculture's Web Soil Survey (WSS), an online, GIS-based mapping tool. A printout of the results of the WSS research is included in Appendix A.1.

The Ten Mile Creek begins at the Lake Myosotis Dam, which is located in the Huyck Preserve, and runs generally easterly through the Town of Rensselaerville, crossing Delaware Turnpike/Albany County Route 353. Three (3) tributaries of the Ten Mile Creek are also located in and around the service area to the north and northeast of the system. A search of the NYS Department of Environmental Conservation's (DEC) Environmental Resource Mapper (ERM) shows the Ten Mile Creek and tributaries of the Ten Mile Creek are Classified C streams.

The search on the ERM also shows that a portion of the proposed project is near Federally Regulated freshwater wetlands (Albany Hill Road property). There are not any New York State Regulated wetlands located within the service area. The ERM also shows that a large area of the service area and the Preserve are in the vicinity of the Yellow-banded Bumble Bee. While this is noted, New York State does not currently have the yellow-banded bumble bee listed as threatened, endangered, or of concern. A printout of the NYSDEC ERM map showing the Rensselaerville Water District Service Area and proposed project areas is included as Appendix A.2.

National Flood Hazard Layer Flood Insurance Rate Maps (FIRMette) for the project areas are included as Appendix A.3. As shown in the maps in this appendix, the proposed project areas are in zones categorized as "Minimal Flood Hazard". Areas immediately adjacent to the Ten Mile Creek are within the flood Zone A, meaning areas are within a

1% chance of flooding annually. Proposed work in these areas will be avoided wherever possible.

## **2.2 Ownership & Service Area**

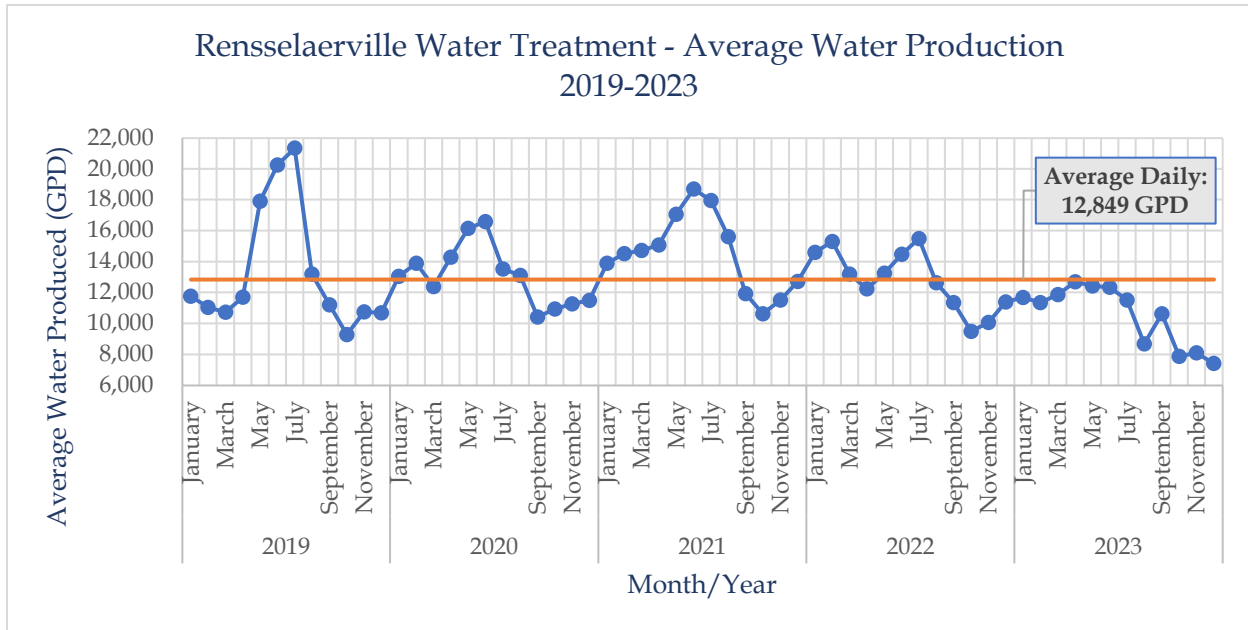
The Rensselaerville Water District owns and operates the water treatment plant, distribution system, buried water storage tank, and pump station. The Water Treatment Plant is operated by a part-time plant operator who is contracted by the Water District to manage plant operations.

The Water Treatment Plant is located on a parcel owned by the Water District on Rice Road. Access to the treatment plant is permitted along a privately owned road from Pond Hill Road. The treatment plant is also located adjacent to the Huyck Preserve (Preserve). A site aerial map depicting the existing water treatment plant and its surrounding area is included as Figure 3. The raw water intake, located at the Rensselaerville Water Supply Dam on Ten Mile Creek, is within the Preserve limits. The raw water intake is located approximately 1,550 feet downstream of the Lake Myosotis Dam. The Lake Myosotis Dam impounds approximately 143-million gallons of water to create Lake Myosotis.

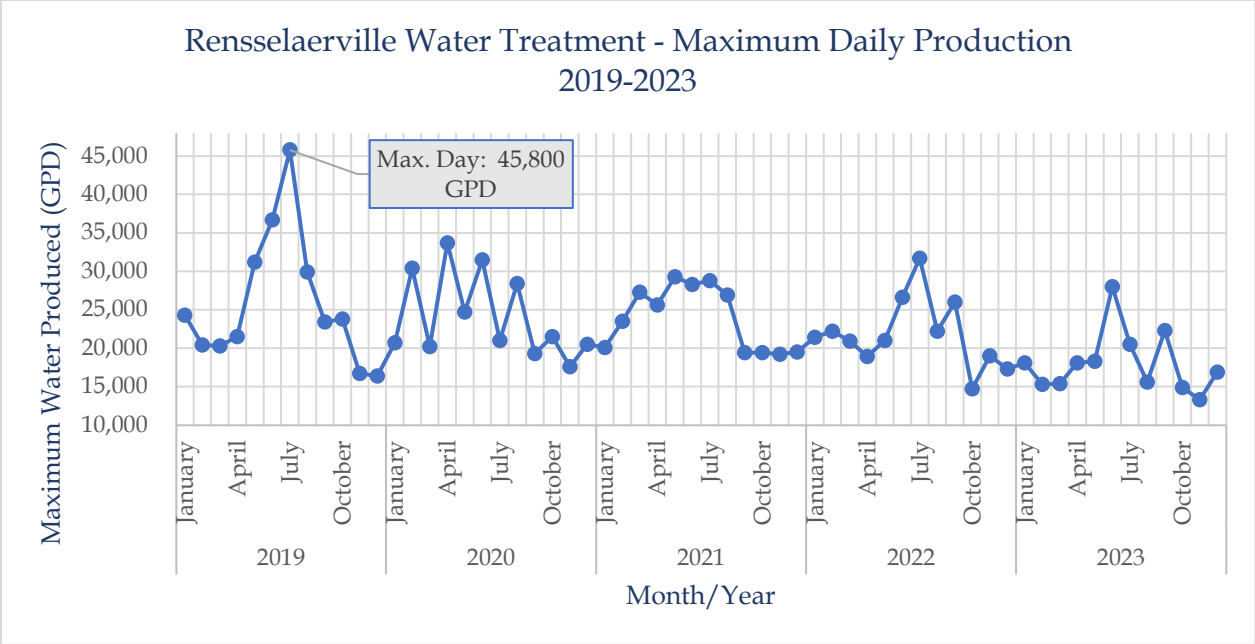
The 6" raw water intake line, which runs approximately 970 feet from the Rensselaerville Water Supply Dam to the treatment plant, is also within the Preserve limits. The Preserve is primarily located in one large area (+/- 2,000 acres), made up of several parcels, northwest of the water system. The Preserve also owns and maintains several other parcels of land within the Town, including a proposed project site adjacent to the existing water distribution system on Albany Hill Road.

The distribution system connects approximately 200 residents within the town to the system, through approximately 79 service lines. The distribution system serves properties along County Route 351, Delaware Turnpike/NYS Route 85, Methodist Hill Road (formally referred to as Crocker Road), and Albany Hill Road. Except for a few municipal owned and community buildings, there are currently no commercial or industrial users connected to the system. Other than the service area, the Town is mostly rural and there are no nearby municipal water distribution systems that tie into the system or would be feasible to tie into.

The system currently uses an average of 13,000 gallons per day (GPD) of water. A summary of the system demands and operational averages dating back to January 2019 are included in the graph below.



The users in the system are not metered, so it is unknown how much of the treated water is unaccounted for due to potential leaks in the system. The maximum single day production was recorded at 45,800 GPD in July 2019. Subsequent high yield days include dates in June 2019 and again in April 2020. A summary of the maximum daily production, dating back to January 2019 is included in the graph on the next page.



The water treatment plant is currently sized to treat 14,400 gallons of water per day, being controlled by the sand filter and GAC filter rates of 10 GPM. The onsite 50,000 gallon buried water storage tank is utilized to store the volumes necessary for the infrequent high demand days.

The distribution system also includes 14 fire hydrants, several of which are inoperable due to age and condition. Flow testing of the operable fire hydrants in the system was conducted on March 25, 2024, by C.T. Male Associates with the assistance of Water District personnel. A water distribution system should be able to provide a minimum fire flow of at least 500 GPM to an opened hydrant. In general, the system is unable to provide adequate fire flow to some locations in the system, particularly around Methodist Hill Road. The equipment utilized for fire flow can measure readings between 530 GPM and 2,120 GPM. There were two hydrants flowed where readings were not obtained, indicating a flow of less than 530 GPM. Results of the flow testing and a map of they system’s hydrant locations are attached in Appendix B.4.

Based on the National Fire Protection Association (NFPA) regulations for fire flow protection, the worst-case scenario for fire protection in the distribution system (non-family dwelling, no sprinkler system) would require minimum flow of 1,000 GPM for up to two (2) hours. This equates to 120,000 gallons over two (2) hours. As the system is currently designed, there is not sufficient storage capacity to meet this requirement,

however there are only a few buildings within the distribution system that have this requirement, including the library and other community buildings.

Most of the system falls within the designation of 1 and 2 family dwellings, not exceeding 5,000 square feet of fire area, with minimal separation between buildings. For this case scenario, NFPA requires 1,000 GPM for up to one (1) hour. Though the current system does not meet this requirement (50,000 gallon buried storage), a 60,000-gallon tank will provide sufficient storage in this scenario.

The estimated population of the entire Town is approximately 1,798 persons, taken from the 2022 U.S. Census Bureau’s Population and Housing Unit Estimates. The table below summarizes the population trend from the U.S. Census.

<b>Town of Rensselaerville - Population Data</b>			
<b>Year</b>	2000	2010	2020
<b>Population</b>	1,915	1,844	1,826

As shown in the above table, the population of the Town has not seen significant growth or decline in the past 20+ years. It shall be noted that the water system does not serve the entire Town, but this is representative of the growth trends within the service area. Though the distribution system was upsized and replaced in the 1980s, the distribution system has not been extended to serve additional areas since the establishment of the water district in 1943. For this reason, significant increase in demand due to population growth or district expansion is not expected.

### **2.3 Existing Facilities**

The water treatment plant consists of a settling tank, a slow sand filter, a granular activated carbon (GAC) tank, and chlorine disinfection. At the water treatment plant, there is also a 50,000-gallon buried water tank which stores the treated water before being distributed by gravity to the users of the system. A process diagram depicting the existing treatment plant flow is included in Appendix B.2.

The raw water intake is located in the Ten Mile Creek, upstream of the Rensselaerville Water Supply Dam, where the water enters the system via a buried 6” ductile iron pipe. The water travels by gravity to the water treatment plant on Rice Road where it enters

the treatment facility. Rice Road is a privately owned roadway that is used to access the treatment facility from Pond Hill Road. The Town does not own Rice Road.

Much of the original water treatment plant, built in the 1940s, is still in place including the buried settling tank, sand filter tank and water storage tank. Amendments to the treatment process have been made over the years to combat the persistent finished water quality violations. The addition of a GAC tank, revisions to the sand filter material, and the addition of a permanganate dosing pump at the settling tank have all been implemented at the treatment plant over the last five (5) years.

The buried water storage tank was inspected by Atlantic Underwater Services in April 2024. The results of the inspection noted that the tank was overall in adequate condition for its age, with minor recommendations for maintenance and improvements. Observations of stains, stalactites, and/or leaks from exterior water were noted. The inspection report is attached in Appendix B.3.

The distribution system provides water to approximately 79 properties in the Town, distributed primarily along 8-inch and 6-inch ductile iron water main. The distribution system was upgraded to the existing piping in the 1980s. Design plans for the distribution system are attached in Appendix B.1. The system also has 14 fire hydrants distributed at appropriate intervals throughout the system, though several are in poor condition and are marked as out of service.

Due to topographic restrictions, a pump station on Methodist Hill Road feeds a small portion of the water system. At the time of C.T. Male's site investigation, the pump station was noted to be not operating correctly. According to Water District personnel, the pressure tank has been out of service for several months and the pump itself has been running continuously to supply flow to users in higher elevations. When the pumps are operating, the pressure to this area meets 10-State Standards minimum required pressure of 35 psi, however the condition of the pump station is deficient and is at high risk for failure.

## **2.4 Need for Project**

The Rensselaerville Water District's Treatment Plant was constructed and put online in 1943. Until 2021, when the GAC filter and the permanganate dosing pumps were added

and the sand filter media was replaced, very few improvements had been made to the water treatment plant.

The Rensselaerville Water Treatment Plant Operator monitors finished water quality, as required by the NYSDOH. Records dating back as far as 1986 show that the District has consistently been near or in excess of the MCLs for various disinfection byproducts (DPBs), including THMs and HAAs. Records provided by the Water District are included in Appendix B.5. Disinfection byproduct formation is a greater concern for water supplies with a surface water as their source, since DBP formation is related to organic content in raw water supply.

In 2021, in an effort to address the violations, the Water District hired Kaaterskill Associates to design and implement modifications to their existing water treatment process. As a result of the report, and with approval by the Albany County Department of Health, a Granular Activated Carbon (GAC) filter was installed for targeted treatment of DBPs. Due to site restraints at the existing plant, the GAC filter cannot be backwashed in place, so maintenance of the GAC has not been conducted in conformance with the maintenance guidelines provided by the manufacturer.

The GAC Tank was installed and put online in 2021. Since the GAC tank was installed, there has not been a recorded decrease in DBPs. The District has continued to be in violation of MCLs associated with THMs and HAAs on some occasions. Testing results from February 2021 to May 2022 triggered two separate notifications to the users of the system for MCL exceedance. Actions taken since these events include the removal of a beaver dam upstream of the raw water intake, increase frequency of hydrant flushing, the changeout of GAC media in the tank, and working with the GAC filter design firm, East Coast Filter for further recommendations. East Coast Filter has also recommended the replacement of the GAC with a different GAC media that was previously used.

Between the dates of August 8, 2022 and August 23, 2022, samples of finished water collected exceeded the MCL for turbidity. Although it was believed to be a seasonal condition of the raw water, the District has added a permanganate dosing pump to treat the raw water as it is entering the plant. The permanganate is used to assist in control of DBP formation. Copies of the public notifications from the Department of Health regarding the 2021 and 2022 MCL violations are attached within Appendix B.6.

There are clear trends that indicate that either the existing water treatment plant, the water source, or a combination of both factors, result in the plant frequently exceeding water quality standards for disinfection byproducts and for turbidity. With regards to the 2022 exceedances for turbidity, this can be related to seasonal water quality depending on weather factors during August of 2022. High turbidity in creeks or streams generally occurs after a period of significant heavy rain. In the case of this water source, turbidity could also be a factor depending on operation of the Lake Myosotis spillway and any low-level flow controls.

## **2.5 Capacity Development**

The Capacity Development Program Evaluation Form is attached as Appendix D. The Smart Growth Assessment Form is attached as Appendix E.

## **3.0 ALTERNATIVES ANALYSIS - WATER SOURCE & TREATMENT**

The following sections outline alternatives for upgrades and improvements to the water system. A variety of alternatives to combat the existing deficiencies in finished water quality were evaluated, ranging from no action, new treatment facilities at the existing site, and creating a new water source and treatment facility at a new site adjacent to the distribution system.

Deficiencies to be addressed include the following:

- Disinfection byproduct violations
- Quality of raw water
- Age of infrastructure
- Operational and maintenance processes

## **3.1 Alternative 1 - New Groundwater Source**

### **3.1.1 Description**

Alternative 1 includes the construction of a new groundwater source well field and treatment facility. The viability of this site being utilized as the new ground water source for the Water District is described in the Source Water Assessment, which was completed by C.T. Male in March 2024. The Source Water Assessment is attached in Appendix C.1. Other groundwater site options were evaluated, however due to distance from the

system, property ownership, and assumed subsurface conditions, the Albany Hill Road site was determined to be the best potential groundwater source in the area, from both a quantity and quality perspective.

The proposed groundwater source well field is located at the northeast end of the distribution system on Albany Hill Road. A site location map is attached as Figure 4. The well field, which will comprise of at least two (2) water supply wells and one (1) backup well will meet the demands of the Water District, as well as the NYSDOH and NYSDEC source requirements.

The Source Water Assessment, which did not include any monitoring wells or extensive site testing, recommended the use of a Preserve owned property, north of the Town Park on Albany Hill Road. This location is near the east end of the distribution system. This location is the closest potential well field location to the existing system and would require minimal extension of the distribution system to connect. Connection of this site to the existing distribution system will require the installation of approximately 1,110 feet of 8-inch HDPE watermain along Albany Hill Road, along with abandoning the existing 6-inch DIP section that currently exists along Albany Hill Road.

An investigation of the site before final design progresses will be required and would require the installation of monitoring wells to be drilled, developed and sampled to compare to NYSDOH Part V criterion and assess if sufficient water quantity and quality can be attained. If the groundwater quality indicates no significant treatment is required and sufficient water quantity can be attained, each test well can be connected to the existing distribution system for the Water District to distribute to its users. Due to the favorable conditions believed to be present at this groundwater source from a water quality standpoint, the need for additional treatment beyond disinfection is not likely and not included in the estimates of probable construction cost.

The ground water sources will be pumped to a new 500 square-foot disinfection and metering building, where the water would be disinfected with sodium hypochlorite (chlorine) prior to being sent to the distribution system. Sodium hypochlorite is being proposed as it is a common disinfection process and is generally the most cost-effective option. At the time of this report, only a desktop review of the ground water quality has been done, and it is assumed that minimal treatment is necessary to meet quality drinking water standards. The plant will also include five (5) 120-gallon pressurized contact tanks, in parallel, in order to provide sufficient contact time for the disinfectant.

Pump controls at the water treatment plant shall be coordinated with the water levels of the water storage tank at Rice Road. This will allow the plant to adjust the quantity of water being made without compromising water age in the system. The water storage tank at Rice Road is at the furthest opposite end of the distribution system to the proposed water treatment plant. Increased water age is a contributing factor to the existing disinfection byproduct violations, and this proposed design will assist in minimizing water age by time it reaches the customers.

This Alternative also includes the decommissioning and demolition of the existing treatment plant facilities at Rice Road, including the concrete settling tank, the buried sand filter, and the chemical feed building. The existing treatment facilities will remain online during the construction and installation of the new plant.

### 3.1.2 Opinion of Probable Construction Cost

The budget level opinion of probable cost for Alternative 1 is \$1.59 million. A summary of the probable construction cost is presented below.

<b>Alternative 1 - Groundwater Source (Albany Hill Road)</b>	
Item	Total Price
Construction Costs	
Well Field Site - Albany Hill Road	\$ 733,949.00
Distribution System - Albany Hill Road/County Rt 361	\$ 265,160.00
Existing WTP Site - Rice Road	\$ 34,500.00
Subtotal	\$ 1,033,609.00
Contingency	\$ 186,049.62
Construction Subtotal	\$ 1,219,658.62
Non-Construction Costs	
Hydrogeological Services	\$ 127,950.00
Other	\$ 243,931.72
Non-Construction Subtotal	\$ 371,881.72
Alternative 1 - Total Cost	\$ 1,591,540.34

A detailed breakdown of the cost opinion is included in Appendix F.

### **3.1.3 Non-Monetary Factors**

The proposed well field and treatment plant location is currently owned by the Huyck Preserve and an agreement would be required to obtain permissions for the Water District to utilize this property. The Huyck Preserve has a mission to maintain and keep natural the Preserve for generations to come. The construction of the well field and treatment plant on this property would result in minimal disturbance to the existing environment. The installation of a drilled well would also align with the Preserve's goals of keeping the resources withing the preserve natural and clean.

Although a desktop review has found that this specific location for well source water anticipates a high quality of raw water, the exact water quality and yield is unknown at this time. Additional testing is required to understand the viability of this source water location, as well as if any additional treatment measures are needed.

In general, groundwater sources are far less susceptible to individual weather events and will be able to provide a consistent quality of source water to the Water District for treatment. In addition, ground water sources are less likely to be a source of turbidity and organics, which will minimize the concerns for turbidity and disinfection byproduct violations. For the purpose of this report, it is assumed that only disinfection of the well water will be required for this Alternative.

## **3.2 Alternative 2 - Existing Surface Water Source (Ten Mile Creek) with New Treatment Facilities**

### **3.2.1 Description**

Alternative 2 includes the construction of a new packaged water treatment facility at the existing Rice Road treatment plant location. A site location map is included in Figure 5. A packaged plant designed for the specific raw water quality of the Ten Mile Creek would cater to the needs of the system.

The raw water is high in turbidity and organics, so this Alternative will utilize a membrane filtration system to filter the water prior to disinfection. The use of a membrane filtration system, such as a Pall Aria AP-2 water treatment system, is designed to remove organics, suspended solids/turbidity, viruses, and bacteria from the water, which will provide a higher quality water prior to disinfection. This will effectively assist in the disinfection byproduct issues that the system is currently experiencing.

The use of a membrane filtration system for source water applications requires the addition of a coagulant prior to filtration. A dosing of sodium hydroxide will be added to the raw water prior to filtration. Following filtration, the water will be disinfected with sodium hypochlorite (chlorine) prior to entering the water storage tank on site. A conceptual schematic of the proposed filtration system and technical specification data is included in Appendix G.

The use of a membrane filtration system requires a backwash cycle of the filters (flux maintenance/reverse filtration), which is done several times a day, and a routine deeper cleaning of the filters, Clean in Place (CIP) or Enhanced Flux Maintenance (EFM), which is done either once a month with CIP or every two (2) days with EFM. The membrane filtration systems utilize citric acid in cleaning the filters. The membrane filters shall be replaced every 10 years.

The membrane filtration system is estimated to produce approximately 1,800 gallons of wastewater per day (657,000 gallons per year) from the routine backwash cycles, which can be disposed of through a traditional sanitary sewer collection system. As it exists, the plant currently at Rice Road is not connected to the Town of Rensselaerville Sanitary Sewer System. An approximately 625-foot extension of the sanitary sewer collection system, north along Pond Hill Road and southwest to the treatment plant will be required.

This Alternative also includes the decommissioning and demolition of the existing treatment plant facilities, including the concrete settling tank, the buried sand filter, and the chemical feed building. The existing treatment facilities will remain online during the construction and installation of the new plant.

A pilot study will be required prior to the full design of a membrane filtration plant.

### **3.2.2 Opinion of Probable Construction Cost**

The budget level opinion of probable cost for Alternative 2 is \$3.23 million. A summary of the probable construction cost is presented on the following page.

<b>Alternative 2 - Surface Water Source (Ten Mile Creek)</b>	
Item	Total Price
Construction Costs	
Existing WTP Site - Rice Road	\$ 2,145,900.00
Sanitary Sewer Extension - Pond Hill Road to WTP	\$ 137,700.00
Subtotal	\$ 2,283,600.00
Contingency	\$ 411,048.00
Construction Subtotal	\$ 2,694,648.00
Non-Construction Costs	
Non-Construction Costs Subtotal	\$ 538,929.60
Alternative 2 - Total Cost	\$ 3,233,577.60

A detailed breakdown of the cost opinion is included in Appendix F.

### **3.2.3 Non-Monetary Factors**

Many of the existing concerns for raw water quality are believed to be a result of a shallow intake with variable depth to the surface due to weather conditions. The continued reliance on a surface water source such as the Ten Mile Creek will require close monitoring of raw water quality to ensure that dosing throughout the treatment plant is adequate for the changing water conditions.

By utilizing the easement and raw water infrastructure in place within the Preserve, there will be no additional environmental impact made within the Preserve limits.

The new packaged treatment plant is approximately 800 square feet, however it will be larger than the existing treatment plant chemical feed building, which is approximately 180 square feet. In addition, the existing plant is rather discrete (buried holding tank, buried sand filter, low profiled chemical feed building), however in order to maintain drinking water treatment operations during construction, it is unrealistic an equally low profile water treatment plant will be able to be achieved.

The membrane filtration system will require filter backwash to be discharged to the sanitary sewer system. This will require approvals from the wastewater treatment plant to discharge filter backwash to the municipal system. In the event that the wastewater treatment plant does not allow the discharge of backwash, other disposal methods will need to be explored, which could include an onsite dewatering system with solids disposal to an approved waste management facility or land application with approval

from NYSDEC. The extension of the sanitary sewer collection system to the water treatment plant will also require approvals from the Sewer District.

Although not specifically included in the cost opinion and life cycle analysis, the continued use of the existing raw water source will require the Water District to perform any necessary repairs to or NYSDEC compliance studies for the Rensselaerville Water Supply Dam.

### **3.3 Alternative 2A - New Surface Water Source (Lake Myosotis) with New Treatment Facilities**

#### **3.3.1 Description**

Alternative 2A includes the construction of an approximately 2,375 foot raw water intake line up to Lake Myosotis, and a new packaged water treatment plant at the existing Rice Road treatment plant site. The existing raw water line is to be abandoned in place. A site location map is included in Figure 6.

The existing raw water intake is located downstream of the Lake Myosotis Dam within the Ten Mile Creek. A Source Water Analysis was completed by C.T. Male, and evaluated the overall quality of the Ten Mile Creek and greater Lake Myosotis Watershed. In general, the Lake Myosotis Watershed and Lake Myosotis itself were viewed to have low risk to potential contaminants and could be a favorable water source with a proper raw water intake. The Source Water Assessment is attached in Appendix C.2.

A new raw water intake within Lake Myosotis could provide enough depth to minimize organics getting to the water treatment plant. As a surface water source, a traditional water treatment plant would still be required to include sedimentation, filtration and disinfection. The current water treatment plant facilities in place are inadequate and do not allow for the required maintenance of the treatment processes. A full replacement of the water treatment plant would be required for this Alternative. A combination of monetary and non-monetary factors makes this Alternative undesirable for consideration.

#### **3.3.2 Opinion of Probable Construction Cost**

The budget level opinion of probable cost for Alternative 2A is \$1.24 million. A summary of the probable construction cost is presented on the following page.

<b>Alternative 2A - Surface Water Source (Lake Myosotis)</b>	
Item	Total Price
Construction Costs	
Raw Water Line Extension	\$ 296,875.00
Raw Water Line Intake into Lake Myosotis	\$ 500,000.00
Mobilization/Demobilization, General Conditions & Other	\$ 80,000.00
Subtotal	\$ 876,875.00
Contingency	\$ 157,837.50
Construction Subtotal	\$ 1,034,712.50
Non-Construction Costs	
Non-Construction Costs Subtotal	\$ 206,942.50
Alternative 2A - Total Cost	\$ 1,241,655.00

A detailed breakdown of the cost opinion is included in Appendix F.

Due to the high cost of constructing the raw water line extension to Lake Myosotis and the installation of the intake in Lake Myosotis, this Alternative was not further investigated. This cost summary does not include the costs associated with the construction of a new water treatment plant or other associated construction requirements.

### **3.3.3 Non-Monetary Factors**

The installation of a new raw water intake line would have environmental implications on Preserve property. To install the raw water intake line, approximate 1,675 feet of the installation would include significant clearing of Preserve land. The 700 feet of intake closest to the water treatment plant would be able to utilize the mostly cleared path already used for the intake feed line. These areas will need to be maintained clear paths in the case of any maintenance and to provide access to all areas of the intake line.

The installation of the raw water line into Lake Myosotis would require extensive construction, including the temporary dewatering of a portion of the lake. Sheet piling would be utilized to protect the construction area within the lake, and could cause a significant disruption to the habitat in and around the area.

The extensive environmental impacts and constructability challenges that would be a result of this Alternative makes this Alternative undesirable for further investigation.

### **3.4 Alternative 3 - Individual Private Wells**

#### **3.4.1 Description**

Alternative 3 includes the decommissioning of the existing water treatment plant and distribution system and constructing individual drilled well sources to all Water District customers. This alternative considers the dissolution of the Water District and will require each property to be served by their own private well.

Each of the 79 customers of the Water District would be provided a 6-inch cased bedrock drilled well (200' deep, each with a 2 hp submersible pump, objective yield of 5 GPM) and site piping. Upon completion of the project, the wells, piping and in-home units will be the responsibility of the homeowner to maintain.

Separation between wells and on-site septic systems is generally the driving factor when deciding if a well can be drilled. All properties are in the existing Town of Rensselaerville Sewer District, except for one current water district customer, which is the property of 464 Albany Hill Road. In order to meet minimum separation requirements between septic tanks, absorption fields and the proposed well to be drilled, the property at 464 Albany Hill Road will need to be connected to the municipal sanitary sewer collection system. The last known connection to the sewer system is the property at 473 Albany Hill Road, which is approximately 400 feet south of 464 Albany Hill Road. The installation of two (2) sanitary sewer manholes, approximately 400 feet of 8" sanitary sewer main, and a sanitary sewer service lateral are included as part of this Alternative.

#### **3.4.2 Opinion of Probable Construction Cost**

The budget level opinion of probable cost for Alternative 3 is \$1.88 million. A summary of the probable construction cost is presented on the following page.

<b>Alternative 3 - Private Individual Wells</b>	
Item	Total Price
Construction Costs	
Existing WTP Site - Rice Road	\$ 34,500.00
Distribution System	\$ 1,261,500.00
464 Albany Hill Road	\$ 94,800.00
Subtotal	\$ 1,390,800.00
Contingency	\$ 250,344.00
Construction Subtotal	\$ 1,641,144.00
Non-Construction Costs	
Non-Construction Costs Subtotal	\$ 237,000.00
Alternative 3 - Total Cost	\$ 1,878,144.00

A detailed breakdown of the cost opinion is included in Appendix F.

### **3.4.3 Non-Monetary Factors**

Drilling the individual wells may be a challenge to meet minimum separation requirements and each property would have to be analyzed and potential variances from separation distance requirements would need to be approved on a case-by-case basis. There are also properties with backyards on the Ten Mile Creek that have a very limited amount of space on their properties to drill a well and maintain adequate separation.

The water quantity and quality for individual drilled wells are unknown at this time. The water quantity, although believed to be acceptable for a residential water well from a desktop review, cannot be guaranteed and may require additional testing. The continuous monitoring of water quality would no longer take place by the municipal water supply and would be the responsibility of the individual homeowner to check the long-term quality of the water entering their homes.

The dissolution of the Water District would be a direct result of this Alternative, however, some mechanism would need to be in place to bond the capital cost to install the wells over time. This would likely require the water district to be in place from a taxing perspective only until the bond is paid off.

The extension of the sanitary sewer collection system to the property of 464 Albany Hill Road will require approvals from the Sewer District.

### **3.5 Alternative 4 - No Action**

#### **3.5.1 Description**

Alternative 4 is no action.

If no action is taken, finished water quality will continue to be in violation of NYSDOH drinking water standards and the aging treatment infrastructure will continue to deteriorate. The no-action alternative is not recommended.

### **4.0 ALTERNATIVE ANALYSIS - WATER STORAGE TANK**

The following sections outline potential alternatives for water storage in the system. Although the buried water storage tank appears to be in acceptable condition when compared with its age, the tank itself is nearing 80 years old and should be replaced. Alternatives have been reviewed to consider the Water District's needs for fire protection volume, water age concerns in the system, land available to the Water District, and other factors. A no action approach is also considered.

As discussed previously in this report, the minimum fire storage requirement for one- and two-family homes is to provide 1,000 GPM for at least one hour. This equates to a minimum volume of 60,000 gallons, which is 20% more volume than the system currently has capacity to store. There are a few customers in the Water District who require additional flow duration due to size, use, and proximity to nearby properties. These properties require a minimum of 1000 GPM for at least two (2) hours, which equates to 120,000 gallons. It is believed that any additional increase in storage beyond the 20% will be detrimental to solving the system's concerns with disinfection by products and water age. The most ideal location for a new water storage tank is in the same location as the existing water storage tank, so this report does not offer alternatives to relocate the tank to another property. The existing location is ideal from an elevation and location within the distribution system perspective.

## 4.1 Alternative 1 - Welded Carbon Steel Ground Storage Tank

### 4.1.1 Description

Alternative 1 includes the construction of a new 60,000 gallon welded carbon steel ground storage tank at the existing Rice Road property. This alternative also includes the demolition of the existing 50,000 buried storage tank upon installation of the new tank.

In order to maintain adequate storage volume for fire protection, the existing 50,000 gallon buried water storage tank treatment plant property will be replaced at the site. The tank will be replaced with a 60,000 gallon, 26-foot diameter, welded carbon steel ground storage tank to meet the minimum storage requirements for most of the Water District.

The interior of the tank will be coated with an epoxy system and the exterior will be coated with an epoxy/ urethane system in accordance with AWWA D102. The tank will also have a mixer mounted to the middle of the tank to help reduce water age, minimize ice formation due to freezing temperatures, and maximize overall water quality.

### 4.1.2 Opinion of Probable Construction Cost

The budget level opinion of probable cost for Alternative 1 is \$661,000. A summary of the probable construction cost is presented below.

<b>Alternative 1 - Welded Carbon Steel Ground Water Storage Tank</b>	
Item	Total Price
Construction Costs	
Existing WTP Site - Rice Road	\$ 466,460.00
Contingency	\$ 83,962.80
Construction Subtotal	\$ 550,422.80
Non-Construction Costs	
Non-Construction Costs Subtotal	\$ 110,084.56
Alternative 1 - Total Cost	\$ 660,507.36

A detailed breakdown of the cost opinion is included in Appendix F.

### **4.1.3 Non-Monetary Factors**

The ground storage tank will require repainting of the interior and exterior surfaces every 20 years. To complete this maintenance, the tank will be required to be drained and taken offline for the duration of the interior paint work. While the tank is offline, fire protection storage requirements will not be met. Additionally, the water available for the users in the distribution system will be limited to the plant capacity for this time, without a temporary storage solution in place. Tank maintenance during a season of lower demand would be recommended.

The ground storage tank is expected to be approximately 16-foot tall and would require fencing around the perimeter for safety and protection of the tank. This is a stark contrast to the existing buried tank that is not visible. This property sits adjacent to the Preserve and is visible from some sections of the hiking trails. The property also sits adjacent to a residential property. It is unknown if a 16-foot tank would be visible from any roadways, aside from Rice Road, in the Town.

## **4.2 Alternative 2 - Cast-in-place Concrete Buried Storage Tank**

### **4.2.1 Description**

Alternative 2 includes the construction of a new 60,000 gallon cast-in-place concrete buried storage tank at the existing Rice Road property. This alternative also includes the demolition of the existing 50,000 buried storage tank upon installation of the new tank. The buried tank option is most similar to the existing storage tank that exists today.

The tank will have a mixer mounted to the middle of the tank to help reduce water age, minimize ice formation due to freezing temperatures, and maximize overall water quality.

### **4.2.2 Opinion of Probable Construction Cost**

The budget level opinion of probable cost for Alternative 1 is \$775,000. A summary of the probable construction cost is presented on the following page.

<b>Alternative 2 - Cast-in-Place Concrete Buried Water Storage Tank</b>	
Item	Total Price
Construction Costs	
Existing WTP Site - Rice Road	\$ 547,625.00
Contingency	\$ 98,572.50
Construction Subtotal	\$ 646,197.50
Non-Construction Costs	
Non-Construction Costs Subtotal	\$ 129,239.50
Alternative 2 - Total Cost	\$ 775,437.00

A detailed breakdown of the cost opinion is included in Appendix F.

#### **4.2.3 Non-Monetary Factors**

This Alternative would provide a buried tank, which would be most similar to the existing buried tank at the Rice Road location. The proposed tank would not be visible from roadways or the Preserve.

The buried tank option would require the least amount of maintenance over its lifetime. No recoating or repainting of the tank would be required, meaning that the tank can stay online at all times.

The water elevation will remain consistent to the existing conditions, so water pressure and flow at hydrants in the system will perform as they do now.

### **4.3 Alternative 3 - No Action**

#### **4.3.1 Description**

Alternative 3 is no action.

This alternative would continue utilizing the existing buried 50,000-gallon storage tank at the Rice Road property. The existing tank, which is the original tank installed in 1943, was most recently inspected by Atlantic Underwater Services in April 2024. The report is attached in Appendix B.3. There are some minor deficiencies noted in the attached report, but overall, the condition of the tank is acceptable. Given it's age (80 years old), the tank

is beyond its useful life and should be replaced. If the Town is planning on a significant capital project that includes other upgrades, this is the time to replace the water tank.

As of this engineering report, the existing tank does not have a mixer in it. While a mixer is generally recommended in water storage applications, this Alternative does not include the installation of a mixer.

#### **4.3.2 Opinion of Probable Construction Cost**

This Alternative would be no cost to the Water District immediately, but over time the tank will deteriorate requiring maintenance or replacement.

#### **4.3.3 Non-Monetary Factors**

The existing storage volume of 50,000 gallons does not provide the distribution system the minimum fire volume required for most of the users in the system, one- and two-family houses.

The existing water quality issues could be attributed to the tank not having a mixer installed, resulting in old water getting to the distribution system. The water quality could also be a result of the condition of the latches on the tank not being watertight and potentially allowing stormwater into the finished water supply.

### **5.0 ALTERNATIVE ANALYSIS - METHODIST HILL ROAD PUMP STATION**

Source Water Alternatives 1, 2, & 2A would continue to feed the water distribution system by gravity. There would continue to be a need to serve the system at higher elevations, so alternative upgrades to the pump station on Methodist Hill Road are evaluated below.

The pump station, which is located north of the property at 10 Methodist Hill Road, serves eight (8) homes north of the pump station. The properties on Methodist Hill Road would not be able to receive the required minimum normal working pressure of 35 psi without the implementation of a pump station. During hydrant flow testing in March 2024, a static pressure reading was taken at the hydrant furthest north on Methodist Hill Road, in front of the last property served on the system. A static pressure reading of 44 psi was recorded.

At the time of this study, the existing pump station had experienced a recent failure of the pressure tank in the pump station, and has been operating solely on the pump since the failure approximately 7 months ago.

## 5.1 Alternative 1 - New Pump Station

### 5.1.1 Description

This alternative includes the full replacement of the pump station on Methodist Hill Road, including the pump vault, a booster pump, and all piping. This Alternative also includes the demolition of the existing vault and its contents.

### 5.1.2 Cost Estimate

The budget level opinion of probable cost for Alternative 1 is \$69,400. A summary of the probable construction cost is presented below.

<b>Alternative 1 - Pump Station Replacement Methodist Hill Road</b>	
Item	Total Price
Construction Costs	
Pump Station - Methodist Hill Road	\$ 49,010.00
Contingency	\$ 8,821.80
Construction Subtotal	\$ 57,831.80
Non-Construction Costs	
Non-Construction Costs Subtotal	\$ 11,566.36
Alternative 2 - Total Cost	\$ 69,398.16

A detailed breakdown of the cost opinion is included in Appendix F.

### 5.1.3 Non-Monetary Factors

The replacement of the existing pump station will provide ease of mind and trust in the system by the customers who are served by this pump station. There are currently 8 customers served by the existing pump station that is unreliable and at risk of failing.

## 5.2 Alternative 2 - No Action

### 5.2.1 Description

Alternative 2 is to take no further action with the repair or replacement of the pump station. The existing pump station, as of this report, has a broken pressure tank which has been offline for over 7 months. During this time, the pump has been running almost non-stop and could fail at any time. The no action alternative is not recommended.

## 6.0 SUMMARY AND COMPARISON OF ALTERNATIVES

### 6.1 Water Source and Treatment

Alternatives related to the raw water source and subsequent treatment were evaluated, including utilization of the existing water source, the Ten Mile Creek (Alternative 2), and the utilization of a new water source, including Lake Myosotis (Alternative 2A), a groundwater source off of Albany Hill Road (Alternative 1), and individual groundwater sources for each user in the system (Alternative 3). With each source water alternative, an acceptable treatment process was included as part of the Alternative. A no action Alternative (Alternative 4) was also evaluated. A summary of each alternative cost is presented below.

Water Source & Treatment Alternatives	
Alternative	Estimated Budget Cost
Alt 1 - New GW Well Site (Albany Hill Road)	\$ 1,591,540.34
Alt 2 - Ex Surface Water (Ten Mile Creek)	\$ 3,233,577.60
Alt 2A - New Surface Water (Lake Myosotis)*	\$ 1,241,655.00
Alt 3 - Private Wells	\$ 1,878,144.00
Alt 4 - No Action	\$ -
* Only includes installation of Raw Water Main	

As discussed previously, due to the high cost of constructing the raw water intake from Lake Myosotis, as well as other non-monetary factors, Alternative 2A was not further investigated.

A no action alternative, Alternative 4, was also included in this report. Taking no action would result in the continuation of disinfection byproduct and turbidity violations, which is unacceptable for a public drinking water supply. Alternative 4 is not recommended.

A 30-year life cycle cost analysis was conducted on the three (3) alternatives being considered, and is summarized below.

30 Year Life Cycle Cost Analysis								
	Alternative 1			Alternative 2			Alternative 3	
	Groundwater Source			Surface Water Source			Groundwater Source	
	Albany Hill Road			Ten Mile Creek			Private Wells	
	Cost	Frequency (Years)	Notes	Cost	Frequency (Years)	Notes	Cost	Frequency (Years)
<b>Design and Construction</b>	\$1,591,540.34	1		\$3,233,577.60	1		\$1,878,144.00	1
<b>Energy*</b>	\$ 1,600.00	30		\$ 500.00	30		\$ -	-
<b>Operation</b>	\$ -	-		\$ 117.00	30	Coagulant	\$ -	-
				\$ 356.40		Citric Acid	\$ -	-
				\$ 4,000.00		Sewer Rate	\$ -	-
<b>Maintenance*</b>	\$ 11,000.00	15	Pump Replacement	\$ 12,000.00	10	Membrane Filters	\$ -	-
	\$ 13,000.00	10	Well Rehab					
<b>Life Cycle Cost**</b>	\$1,619,562.23			\$3,196,936.27			\$1,788,708.57	
* 2024 Dollars Inflated to Future Dollars, where the annual Inflation Rate = 5%								
** Cost expressed as Net Present Value over the length of the analysis, where the Discount Rate = 5%								

Estimated energy usage, operation, and maintenance expenses, that are unique to each alternative only, are part of the 30-year analysis. These values do not include energy, operation, and maintenance expenses that would be shared across Alternatives 1 and 2 (i.e. disinfection, meter usage, etc.). Alternative 3 would not have any additional energy, operation, or maintenance expenses paid for by the Water District, as these expenses would be taken over by the homeowner directly.

After considering the 30-year life cycle cost, Alternative 3, the installation of individual private wells, is estimated to have similar costs as Alternative 1, the new municipal well site on Albany Hill Road. Although they may have similar costs over the 30 year period, there are several non-monetary factors to consider that makes Alternative 3 undesirable. Non-monetary factors include the uncertainty of meeting separation requirements on all properties, the discontinuation of consistent water quality monitoring, and the dissolution of the Water District, except for administratively for the bonding period.

The implementation of Alternative 1 has the lowest cost over the 30-year period, although this does not account for other distribution system improvements, which are discussed below and would be required regardless of whether Alternative 1 or Alternative 2 is chosen. Alternative 1 would also presumably result in the highest quality raw water, which thus requires the least amount of water treatment. A groundwater source would

be less susceptible to varying weather patterns and changes over time, making a groundwater source a preferable water source.

## 6.2 Water Storage Tank

Three (3) options for water storage at Rice Road were evaluated as part of this project. Alternatives include a full replacement of the existing tank with a 60,000-gallon carbon steel ground tank (Alternative 1), or a 60,000-gallon buried cast-in-place concrete tank (Alternative 2). A mixer would be added to either tank alternative. A no action alternative (Alternative 3), consisting of keeping the existing 80-year-old, 50,000-gallon buried concrete tank was also evaluated. A summary of each alternative cost is presented below.

Water Storage Tank Alternatives	
Alternative	Estimated Budget Cost
Alt 1 - New Steel Ground Storage	\$ 660,507.36
Alt 2 - New CIP Buried Storage	\$ 775,437.00
Alt 3 - No Action	\$ -

A recent inspection of the existing tank found that its condition is overall acceptable for its age, however it is over 80 years old and there are some deficiencies that may be contributing to the water quality violations, including signs of infiltration from the roof of the tank, and the lack of mixer in the tank. Alternative 3, no action, is not recommended.

A 50-year life cycle cost analysis was conducted on the two (2) alternatives being considered, and is summarized below.

50 Year Life Cycle Cost Analysis					
	Alternative 1			Alternative 2	
	Ground Storage Tank			Buried Storage Tank	
	Welded Carbon Steel			Cast-in-place Concrete	
	Cost	Frequency (Years)	Notes	Cost	Frequency (Years)
<b>Design and Construction</b>	\$ 660,507.36	1		\$ 775,437.00	1
<b>Energy*</b>	\$ -	-		\$ -	-
<b>Operation</b>	\$ -	-		\$ -	-
<b>Maintenance*</b>	\$ 40,000.00	2	Tank Recoating	\$ -	-
<b>Life Cycle Cost**</b>	\$705,245.10			\$738,511.43	
* 2024 Dollars Inflated to Future Dollars, where the annual Inflation Rate = 5%					
** Cost expressed as Net Present Value over the length of the analysis, where the Discount Rate = 5%					

Estimated energy usage, operation, and maintenance expenses, that are unique to each alternative only, are part of the 50-year analysis. These values do not include energy,

operation, and maintenance expenses that would be shared across both Alternatives 1 and 2, such as the mixer.

Pending extenuating circumstances, the buried concrete storage tank (Alternative 2) has little required maintenance once installed. In comparison, the ground storage tank (Alternative 1) will require recoating of the interior and exterior surfaces approximately once every twenty years. During recoating of the tank interior, the tank would be required to be taken offline, limiting available flow to the customers in the system and availability of fire protection volume. Due to the generally small tank size, the time offline should be limited to a few days.

Based on the evaluated monetary and non-monetary factors of Alternatives 1 & 2, either Alternative would be similarly acceptable and the final determination of which type of water tank to be constructed can be decided once a capital project is chosen.

### **6.3 Methodist Hill Road Pump Station**

The Methodist Hill Road pump station, which serves 8 customers north of the pump station, is currently in need of replacement. A full replacement option (Alternative 1) was evaluated, along with a no action alternative (Alternative 2).

A summary of each alternative cost is presented below.

<b>Methodist Hill Road Pump Station Alternatives</b>	
<b>Alternative</b>	<b>Estimated Budget Cost</b>
Alt 1 - Full Replacement	\$ 69,398.16
Alt 2 - No Action	\$ -

Due to the condition of the existing pump station, Alternative 2 is not recommended.

## **7.0 RECOMMEND AND SELECTED ALTERNATIVES**

The final selection of alternatives is to be determined by the Water District. Recommended alternatives are included in the following sections.

## **7.1 Water Source and Treatment**

Alternative 1, the new groundwater well source and treatment plant on Albany Hill Road, is a recommended alternative. This alternative is estimated to be the lowest cost to the Water District, while also projected to provide the highest quality raw water source. This alternative is also the least susceptible to weather events and is anticipated to be the most sustainable option over time. While this is the lowest cost alternative, other non-monetary factors such as land acquisition and actual water quality play a role in the feasibility of this alternative.

Alternative 2, the continuation of utilizing Ten Mile Creek with the addition of a new membrane filtration plant at Rice Road, is a recommended alternative. It should be noted that this alternative has a high initial cost of the membrane filtration system, as well as a higher annual maintenance cost associated with this Alternative, compared to Alternative 1.

Alternative 2A was not further investigated beyond the extremely high installation cost of the raw water intake. Alternative 2A is not recommended.

Alternative 3 is not recommended due to the legal implications associated with the dissolution of the Water District. There are also limitations, such as separation requirements for wells, that may make some properties unable to utilize this option.

Alternative 4 is not recommended. If the water system continues to operate in its current condition with no action taken, there will continue to be violations of disinfection byproducts and turbidity in the finished drinking water. Not addressing the finished water quality MCL exceedances is not acceptable to the NYSDOH, and will eventually lead to further action being required, possibly under emergency action or a consent order.

## **7.2 Water Storage Tank**

Alternative 1, the carbon steel ground water storage tank, is a recommended alternative. Including anticipated maintenance of the interior and exterior coatings, this Alternative is projected to be the most cost-effective option. This alternative includes an interior tank mixer and provides adequate fire protection volume for most users in the system.

Alternative 2, the buried cast-in-place concrete water storage tank, is a recommended alternative. This alternative is more expensive than Alternative 1, however there are less

maintenance requirements. Visually, this is most similar to the existing tank. This alternative includes an interior tank mixer and provides adequate fire protection volume for a majority of the users in the system.

Alternative 3 is not recommended. If no action is taken, the existing buried water storage tank will continue to be utilized. While the existing tank is in acceptable condition for its age, there are deficiencies in the water tightness of the tank which may be directly impacting the finished water quality. In addition, the existing tank does not have an interior mixer and does not provide adequate fire protection to the system.

### 7.3 Methodist Hill Road Pump Station

Alternative 1, the full replacement of the Methodist Hill Road pump station, is the recommended alternative. A new pump station, with reliable equipment, is needed for the system.

Alternative 2 is not recommended. If no action is taken, the pump station will eventually fail completely, and water will not be able to be delivered to eight (8) customers on Methodist Hill Road.

### 7.4 Debt Repayment

As mentioned, the final alternative selection will be decided on by the Water District. For the purposes of this report, an estimated debt repayment for source water and treatment Alternatives 1 & 2, including the addition of a new water storage tank (Tank Alternative 1) and Methodist Hill Road pump station (Pump Station Alternative 1) have been compiled for comparison below.

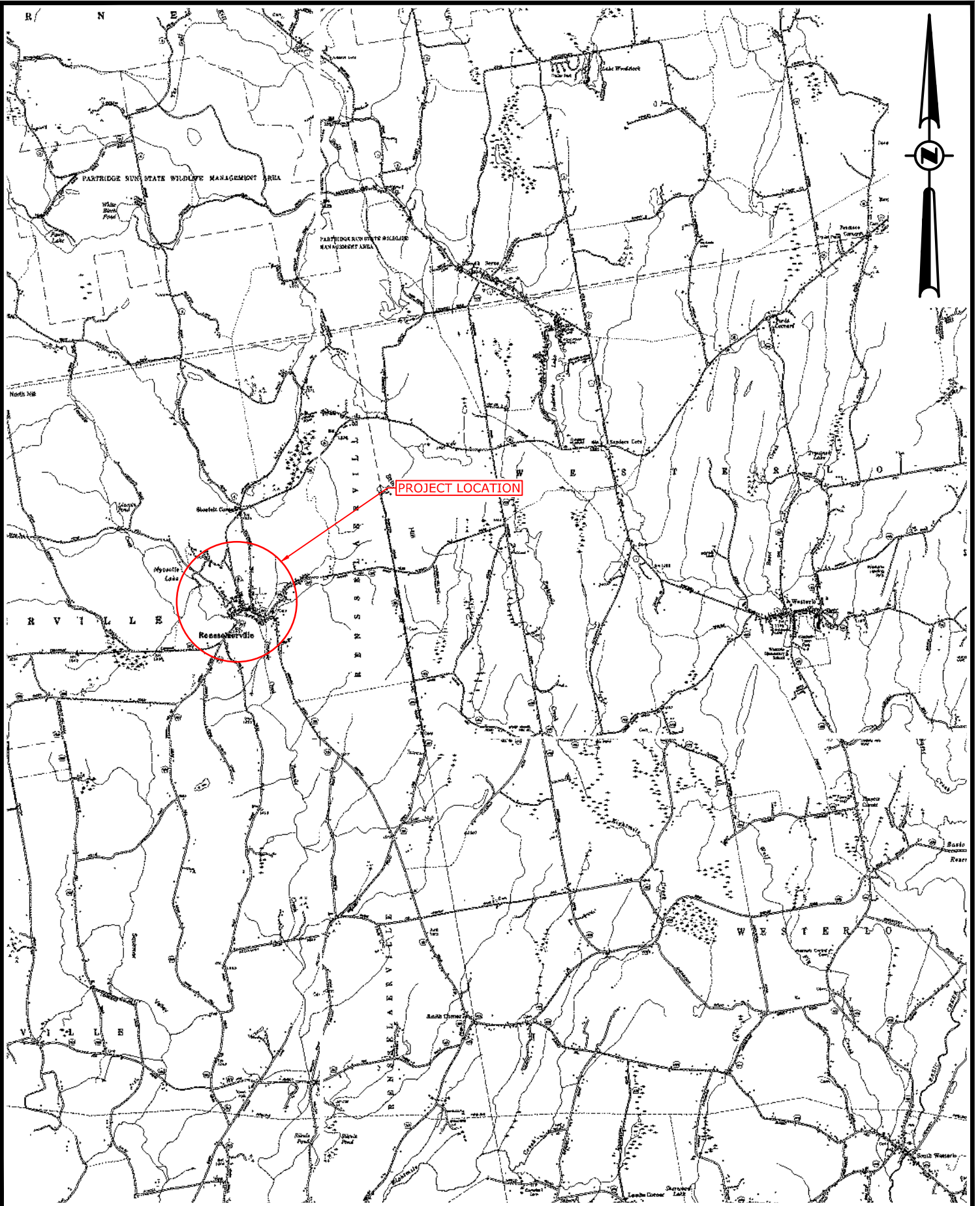
Alternative 1 (AHR Well Site) + Tank Alt 1 (Steel Tank) + Pump Station		Alternative 2 (Ten Mile Creek) + Tank Alt 1 (Steel Tank) + Pump Station	
Total Design and Construction Cost	\$ 2,321,445.86	Total Design and Construction Cost	\$ 3,963,483.12
# of Properties	79	# of Properties	79
Interest Rate	4.75%	Interest Rate	4.75%
Length (Years)	30	Length (Years)	30
Yearly	\$146,737.33	Yearly	\$250,529.60
Per Customer*	\$1,857.43	Per Customer*	\$3,171.26

\* Average cost per customer, does not account for service type or property value

The cost per customer has been estimated for both alternatives. The costs calculated do not account for the property value or the water rate valuation of each customer. The costs

above do not include typical water usage rates currently paid by each customer on a per fixture basis. Based on 2024 water billing data, the average cost per customer was \$745.42. The addition of this amount would estimate the annual cost per customer for Alternatives 1 and 2 to be \$2,603 and \$3,917, respectively. All values calculated do not include any portion of the project being financed through grants.

FIGURE 1  
SITE LOCATION MAP



**C.T. MALE ASSOCIATES**  
 Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
 50 CENTURY HILL DRIVE, LATHAM, NY 12110 PH: 518.786.7400  
 GLENS FALLS, NY • JOHNSTOWN, NY • POUGHKEEPSIE, NY • SYRACUSE, NY



**SITE LOCATION MAP**

**RENSSELAERVILLE WATER DISTRICT  
PRELIMINARY ENGINEERING REPORT**

PROJ. NO.: 24.4005

DRAFTED: BFJ

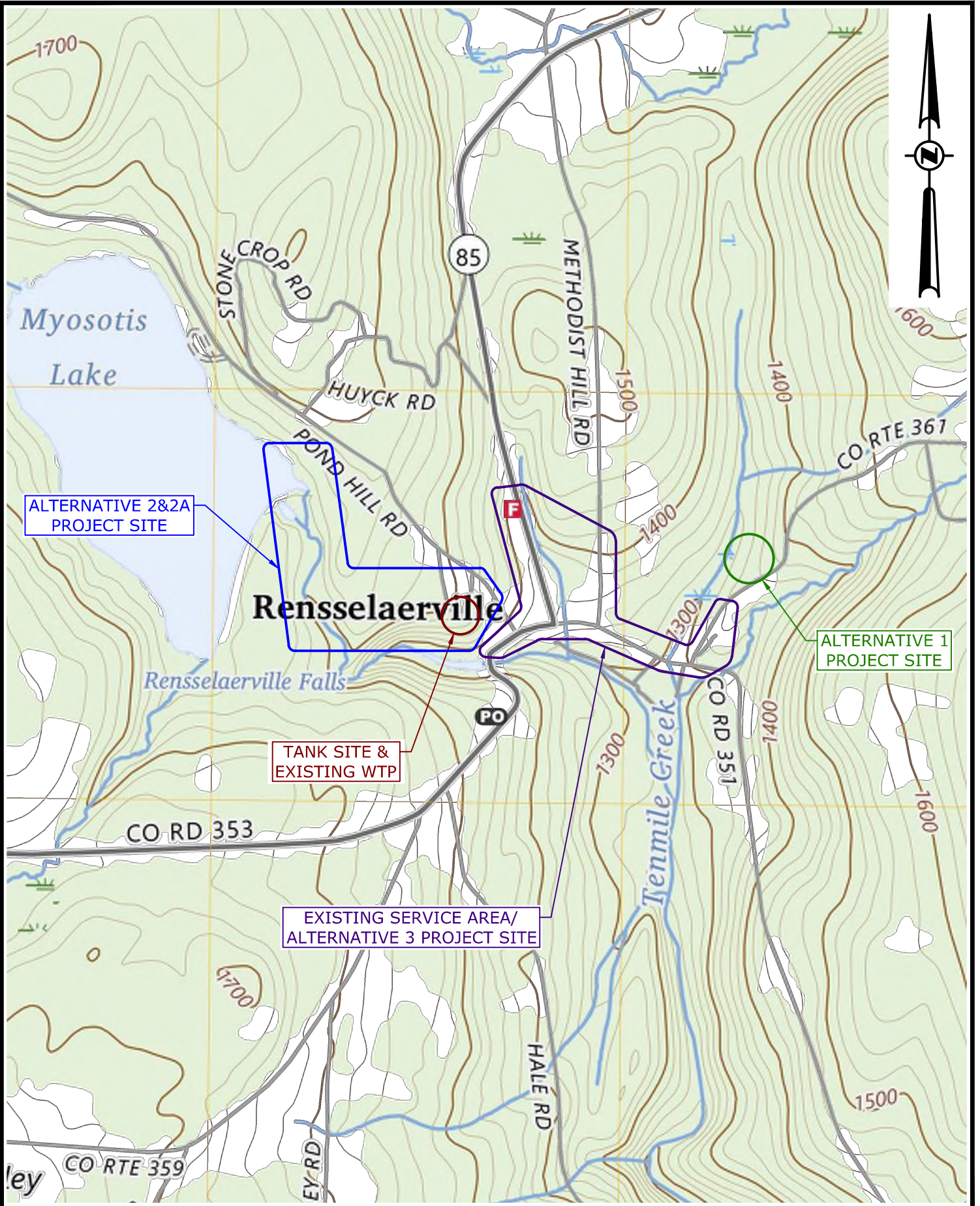
SCALE: N.T.S.

DATE: 05/03/2024

TOWN OF RENSSELAERVILLE

ALBANY COUNTY, NEW YORK

FIGURE 2  
PROJECT LOCATION MAP



**C.T. MALE ASSOCIATES**  
 Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
 50 CENTURY HILL DRIVE, LATHAM, NY 12110 PH: 518.786.7400  
 GLENS FALLS, NY • JOHNSTOWN, NY • POUGHKEEPSIE, NY • SYRACUSE, NY



**PROJECT LOCATION MAP**

**RENSELAERVILLE WATER DISTRICT  
 PRELIMINARY ENGINEERING REPORT**

FIGURE 3

AERIAL SITE PLAN - EXISTING WATER TREATMENT PLANT



RICE ROAD

SAND FILTER (BURIED)

SEDIMENTATION BASIN (BURIED) WITH PERMANGANTE FEED

6" RAW WATER INTAKE FROM TEN MILE CREEK

EXISTING CHEMICAL FEED BUILDING

EXISTING 50,000 GALLON BURIED WATER STORAGE TANK

EXISTING PROPERTY OWNED BY RENSSELAERVILLE WATER DISTRICT

**C.T. MALE ASSOCIATES**  
Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
50 CENTURY HILL DRIVE, LATHAM, NY 12110 PH: 518.786.7400  
GLENS FALLS, NY • JOHNSTOWN, NY • POUGHKEEPSIE, NY • SYRACUSE, NY



**AERIAL SITE PLAN  
EXISTING WATER TREATMENT PLANT**

**RENSSELAERVILLE WATER DISTRICT  
PRELIMINARY ENGINEERING REPORT**

FIGURE 4  
AERIAL SITE PLAN - ALTERNATIVE 1



EXISTING PROPERTY OWNED BY HUYCK PRESERVE, TO BE ACQUIRED BY RENSSELAERVILLE WATER DISTRICT

PROPOSED WELL LOCATIONS

PROPOSED WATER TREATMENT PLANT

APPROXIMATE WETLAND LIMITS

WATERLINE EXTENSION  
8" HDPE, DIRECTIONALLY DRILLED

TIE INTO EXISTING WATER MAIN.  
ABANDON EXISTING 6" MAIN  
ALONG ALBANY HILL ROAD.

ALBANY HILL ROAD

TRINITY LANE

COUNTY ROUTE 351

**C.T. MALE ASSOCIATES**  
Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
50 CENTURY HILL DRIVE, LATHAM, NY 12110 PH: 518.786.7400  
GLENS FALLS, NY • JOHNSTOWN, NY • POUGHKEEPSIE, NY • SYRACUSE, NY



**AERIAL SITE PLAN - ALTERNATIVE 1**

**RENSSELAERVILLE WATER DISTRICT  
PRELIMINARY ENGINEERING REPORT**

PROJ. NO.: 24.4005

DRAFTED: BFJ

SCALE: 1" = 200'

DATE: 05/15/24

TOWN OF RENSSELAERVILLE

ALBANY COUNTY, NEW YORK

FIGURE 5

AERIAL SITE PLAN - ALTERNATIVE 2



**C.T. MALE ASSOCIATES**

Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
50 CENTURY HILL DRIVE, LATHAM, NY 12110 PH: 518.786.7400  
GLENS FALLS, NY • JOHNSTOWN, NY • POUGHKEEPSIE, NY • SYRACUSE, NY

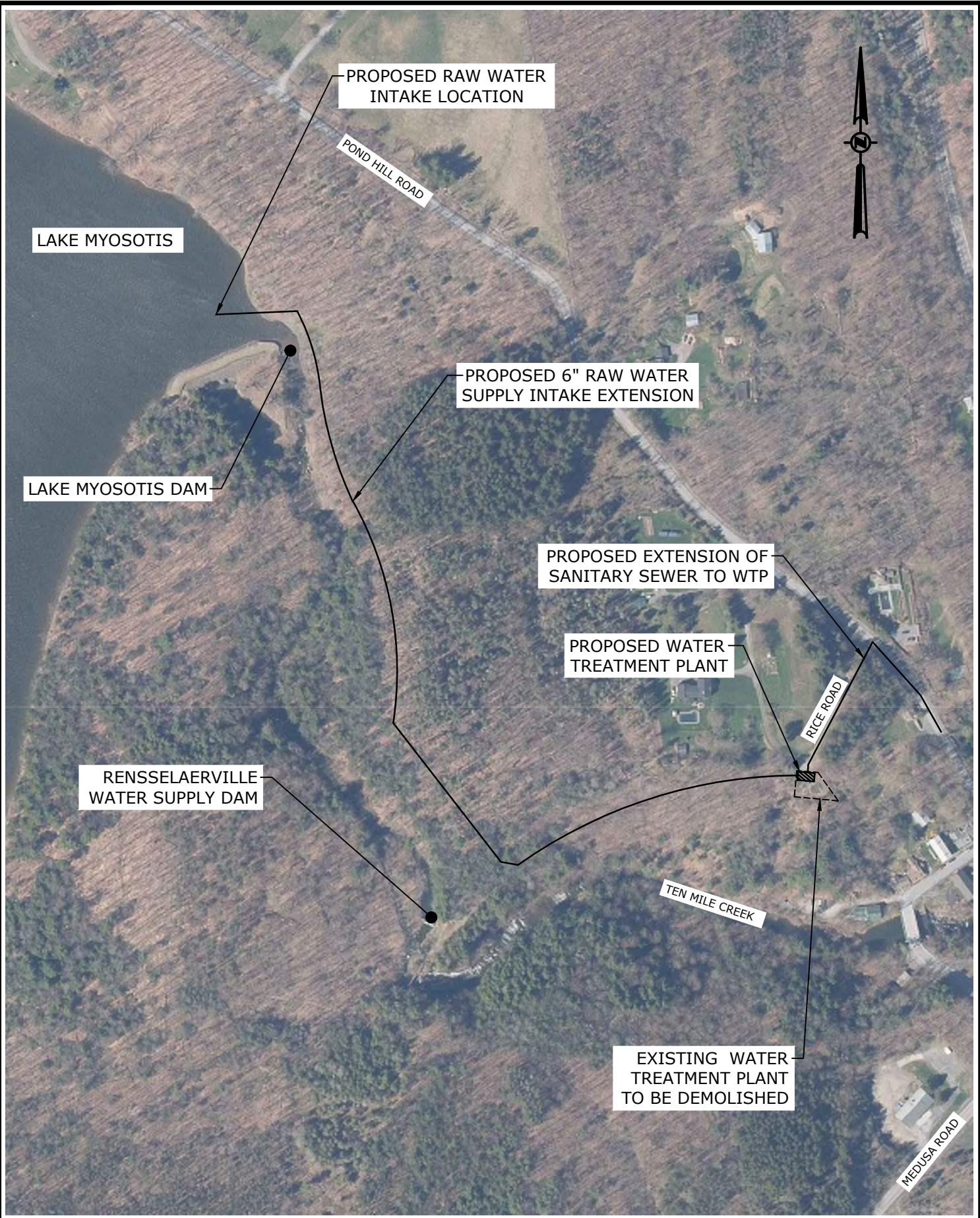


**AERIAL SITE PLAN - ALTERNATIVE 2**

**RENSSELAERVILLE WATER DISTRICT  
PRELIMINARY ENGINEERING REPORT**

FIGURE 6

AERIAL SITE PLAN - ALTERNATIVE 2A



**C.T. MALE ASSOCIATES**

Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
50 CENTURY HILL DRIVE, LATHAM, NY 12110 PH: 518.786.7400  
GLENS FALLS, NY • JOHNSTOWN, NY • POUGHKEEPSIE, NY • SYRACUSE, NY



**AERIAL SITE PLAN - ALTERNATIVE 2A**

**RENSELAERVILLE WATER DISTRICT  
PRELIMINARY ENGINEERING REPORT**

PROJ. NO.: 24.4005

DRAFTED: BFJ

SCALE: 1" = 300'

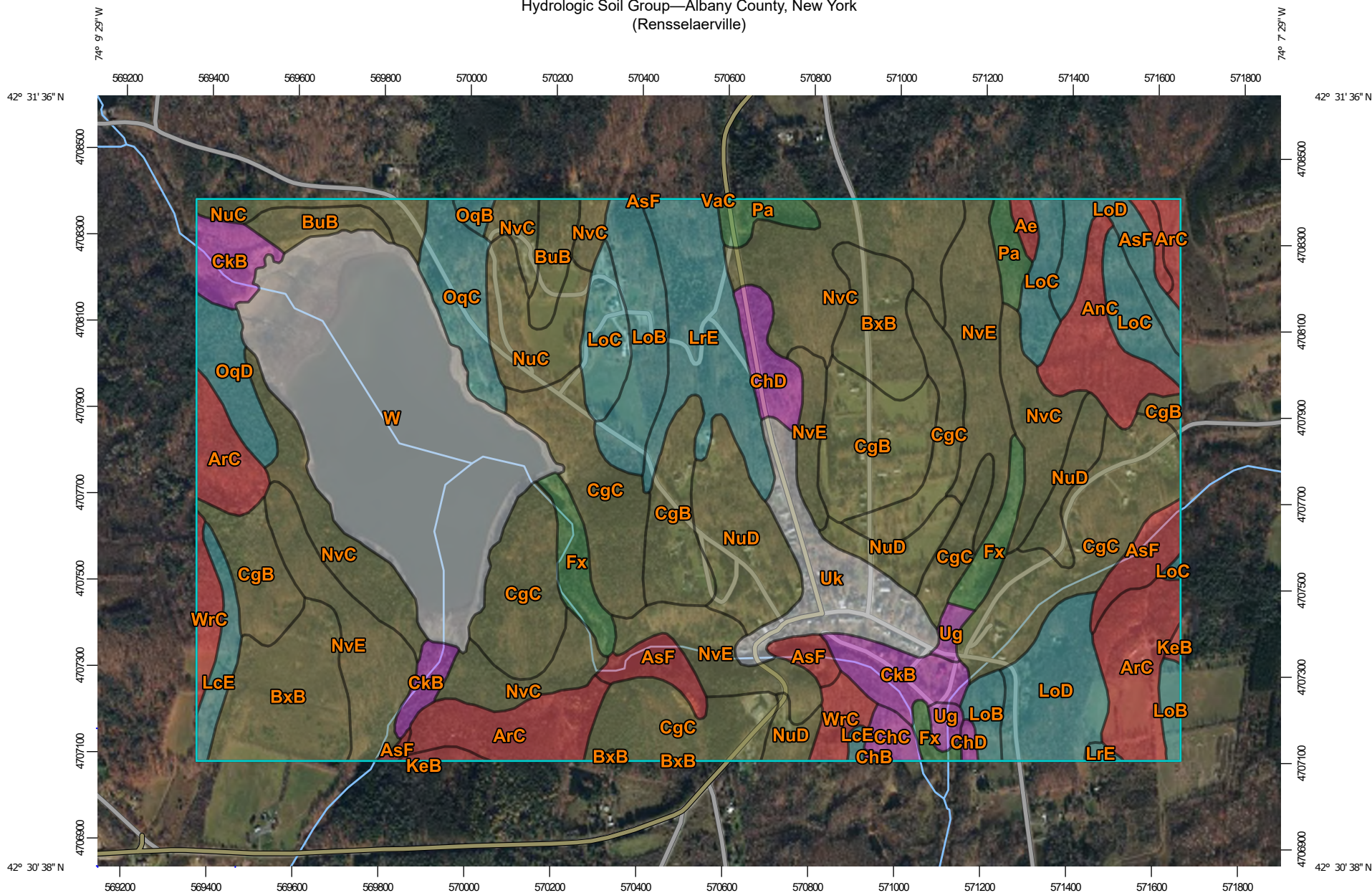
DATE: 05/15/24

TOWN OF RENSELAERVILLE

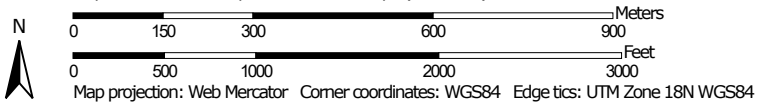
ALBANY COUNTY, NEW YORK

APPENDIX A  
SITE INFORMATION
































Hydrologic Soil Group—Albany County, New York  
(Rensselaerville)



Map Scale: 1:12,600 if printed on A landscape (11" x 8.5") sheet.



## MAP LEGEND

<b>Area of Interest (AOI)</b>		 C
Area of Interest (AOI)		 C/D
		 D
		 Not rated or not available
<b>Soils</b>		
<b>Soil Rating Polygons</b>		
 A		
 A/D		
 B		
 B/D		
 C		
 C/D		
 D		
 Not rated or not available		
<b>Soil Rating Lines</b>		
 A		
 A/D		
 B		
 B/D		
 C		
 C/D		
 D		
 Not rated or not available		
<b>Soil Rating Points</b>		
 A		
 A/D		
 B		
 B/D		
<b>Water Features</b>		
 Streams and Canals		
<b>Transportation</b>		
 Rails		
 Interstate Highways		
 US Routes		
 Major Roads		
 Local Roads		
<b>Background</b>		
 Aerial Photography		

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Albany County, New York  
Survey Area Data: Version 21, Sep 5, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 4, 2020—Nov 7, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ae	Allis silt loam	D	1.5	0.2%
AnC	Angola silt loam, 8 to 15 percent slopes	D	14.1	1.9%
ArC	Arnot very channery silt loam, 8 to 15 percent slopes	D	39.5	5.3%
AsF	Arnot-Rock outcrop complex, 25 to 70 percent slopes	D	15.9	2.2%
BuB	Burdett silt loam, 3 to 8 percent slopes	C/D	10.8	1.5%
BxB	Busti silt loam, 3 to 8 percent slopes	C/D	35.2	4.8%
CgB	Chautauqua gravelly silt loam, 3 to 8 percent slopes	C/D	43.1	5.8%
CgC	Chautauqua gravelly silt loam, 8 to 15 percent slopes	C/D	98.5	13.3%
ChB	Chenango gravelly silt loam, loamy substratum, 3 to 8 percent slopes	A	0.3	0.0%
ChC	Chenango gravelly silt loam, loamy substratum, rolling	A	2.9	0.4%
ChD	Chenango gravelly silt loam, loamy substratum, hilly	A	7.7	1.0%
CkB	Chenango channery silt loam, fan, 3 to 8 percent slopes	A	19.8	2.7%
Fx	Fluvaquents-Udifulvents complex, frequently flooded	A/D	13.7	1.9%
KeB	Kearsarge silt loam, 0 to 8 percent slopes	D	1.6	0.2%
LcE	Lackawanna channery silt loam, 15 to 35 percent slopes, extremely stony	C	6.3	0.9%
LoB	Lordstown channery silt loam, 3 to 8 percent slopes	C	22.2	3.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
LoC	Lordstown channery silt loam, 8 to 15 percent slopes	C	22.0	3.0%
LoD	Lordstown channery silt loam, 15 to 25 percent slopes	C	26.9	3.6%
LrE	Lordstown-Arnot complex, 25 to 45 percent slopes, very rocky	C	27.0	3.6%
NuC	Nunda silt loam, 8 to 15 percent slopes	C/D	19.2	2.6%
NuD	Nunda silt loam, 15 to 25 percent slopes	C/D	34.4	4.7%
NvC	Nunda silt loam, 3 to 15 percent slopes, very stony	C/D	68.3	9.2%
NvE	Nunda silt loam, 15 to 35 percent slopes, very stony	C/D	54.6	7.4%
OqB	Oquaga channery silt loam, 3 to 8 percent slopes	C	1.4	0.2%
OqC	Oquaga channery silt loam, 8 to 15 percent slopes	C	12.6	1.7%
OqD	Oquaga channery silt loam, 15 to 25 percent slopes	C	8.7	1.2%
Pa	Palms muck	A/D	7.7	1.0%
Ug	Udorthents, loamy	A	3.5	0.5%
Uk	Udorthents, loamy-Urban land complex		21.1	2.9%
VaC	Valois gravelly loam, 8 to 15 percent slopes	B	0.0	0.0%
W	Water		90.4	12.2%
WrC	Wellsboro silt loam, 8 to 15 percent slopes	D	8.9	1.2%
<b>Totals for Area of Interest</b>			<b>739.7</b>	<b>100.0%</b>

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

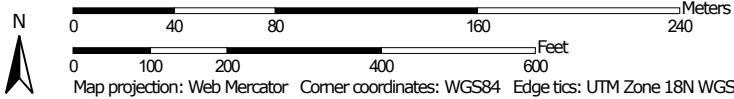
*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher
































Hydrologic Soil Group—Albany County, New York  
(EdmundNilesHuyck\_PreserveParcel\_1)



Map Scale: 1:2,990 if printed on A landscape (11" x 8.5") sheet.



## MAP LEGEND

<b>Area of Interest (AOI)</b>		 C
Area of Interest (AOI)		 C/D
		 D
		 Not rated or not available
<b>Soils</b>		
<b>Soil Rating Polygons</b>		
 A		
 A/D		
 B		
 B/D		
 C		
 C/D		
 D		
 Not rated or not available		
<b>Soil Rating Lines</b>		
 A		
 A/D		
 B		
 B/D		
 C		
 C/D		
 D		
 Not rated or not available		
<b>Soil Rating Points</b>		
 A		
 A/D		
 B		
 B/D		
<b>Water Features</b>		
	Streams and Canals	
<b>Transportation</b>		
	Rails	
	Interstate Highways	
	US Routes	
	Major Roads	
	Local Roads	
<b>Background</b>		
	Aerial Photography	

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Albany County, New York  
Survey Area Data: Version 21, Sep 5, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 4, 2020—Nov 7, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CgC	Chautauqua gravelly silt loam, 8 to 15 percent slopes	C/D	2.1	19.6%
Fx	Fluvaquents-Udifluvents complex, frequently flooded	A/D	2.4	22.3%
NuD	Nunda silt loam, 15 to 25 percent slopes	C/D	3.4	32.1%
NvC	Nunda silt loam, 3 to 15 percent slopes, very stony	C/D	2.7	26.0%
<b>Totals for Area of Interest</b>			<b>10.5</b>	<b>100.0%</b>

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

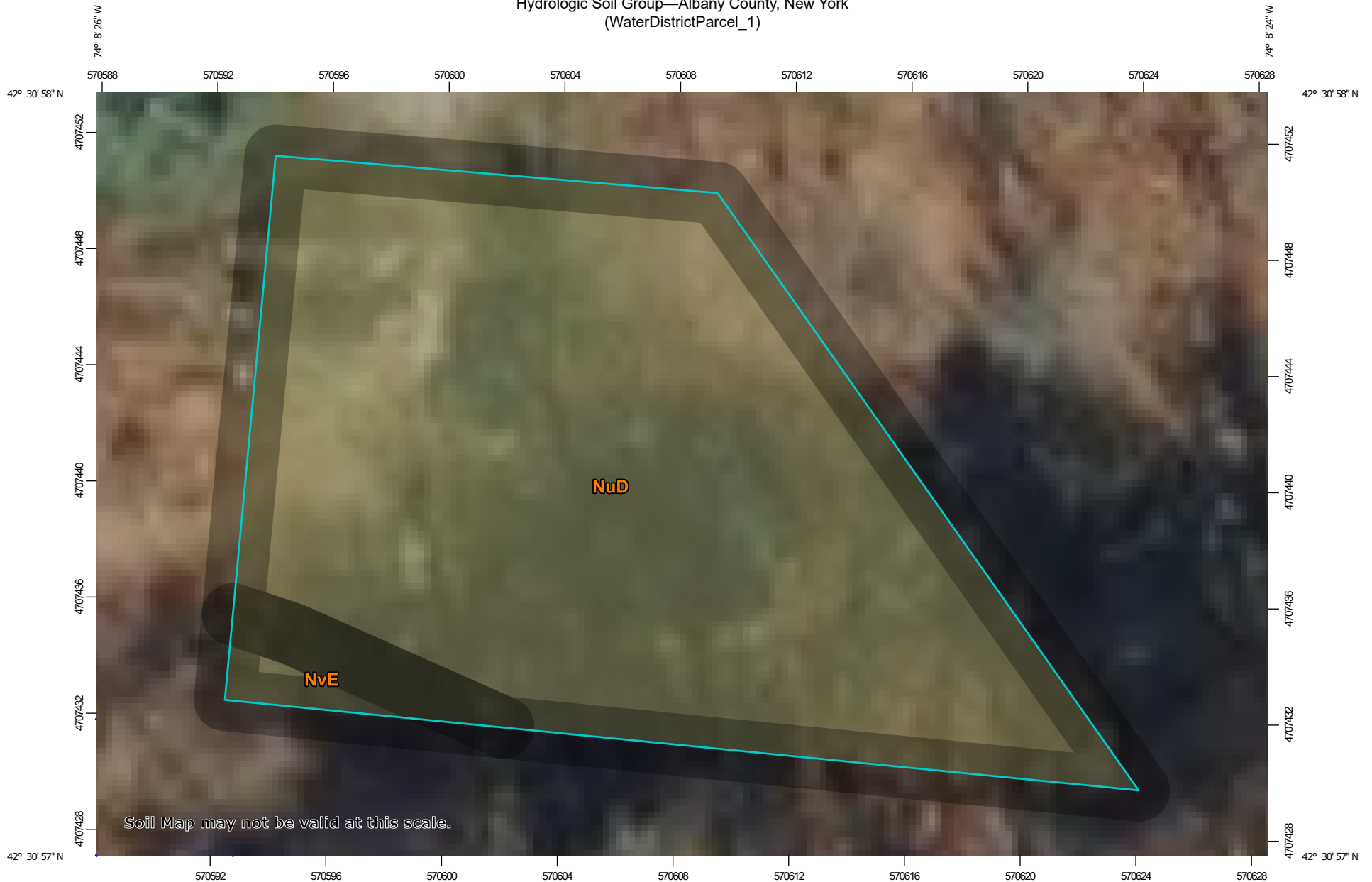
## Rating Options

*Aggregation Method:* Dominant Condition

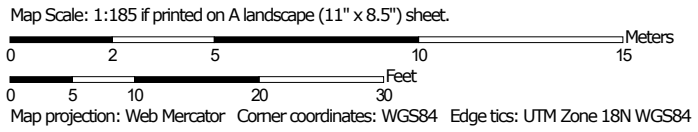
*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher
































Hydrologic Soil Group—Albany County, New York  
(WaterDistrictParcel\_1)



Soil Map may not be valid at this scale.



## MAP LEGEND

<b>Area of Interest (AOI)</b>		 C
Area of Interest (AOI)		 C/D
		 D
		 Not rated or not available
<b>Soils</b>		
<b>Soil Rating Polygons</b>		
 A		
 A/D		
 B		
 B/D		
 C		
 C/D		
 D		
 Not rated or not available		
<b>Soil Rating Lines</b>		
 A		
 A/D		
 B		
 B/D		
 C		
 C/D		
 D		
 Not rated or not available		
<b>Soil Rating Points</b>		
 A		
 A/D		
 B		
 B/D		
<b>Water Features</b>		
 Streams and Canals		
<b>Transportation</b>		
 Rails		
 Interstate Highways		
 US Routes		
 Major Roads		
 Local Roads		
<b>Background</b>		
 Aerial Photography		

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Albany County, New York  
Survey Area Data: Version 21, Sep 5, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 4, 2020—Nov 7, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NuD	Nunda silt loam, 15 to 25 percent slopes	C/D	0.1	96.6%
NvE	Nunda silt loam, 15 to 35 percent slopes, very stony	C/D	0.0	3.4%
<b>Totals for Area of Interest</b>			<b>0.1</b>	<b>100.0%</b>

### Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

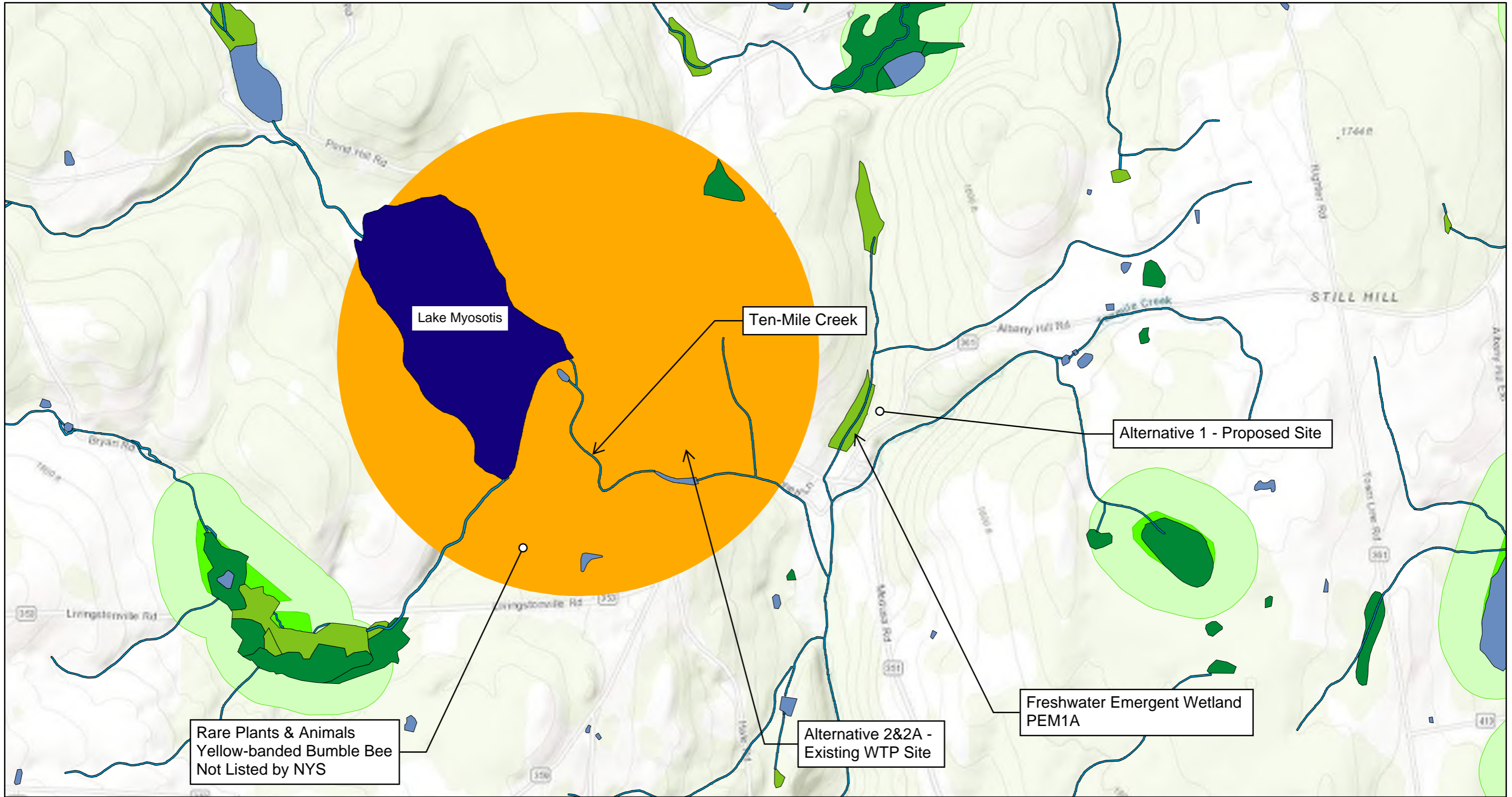
## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

# 5HQVVHODHUYLOOH



### Waterbody Inventory/Priority Waterbodies List

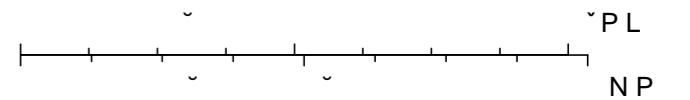
- Lakes and Reservoirs
- Estuaries
- Rivers and Streams
- Shorelines
- State Regulated Freshwater Wetlands (Outside of the Adirondack Park)
- State Regulated Wetland Checkzone i

### Significant Natural Communities

- Significant Natural Communities
- Natural Communities Near This Location i
- Rare Plants or Animals

### National Wetlands Inventory

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine



(VUL & DQDGD (VUL + (5( \*DUPLQ ,1&5(0(17  
1\$6\$ (3\$ 86'\$

# 5HQVVHODHUYLOOH

Alternative 1 Proposed Site



Freshwater Emergent Wetland  
PEM1A

### Waterbody Inventory/Priority Waterbodies List

- Lakes and Reservoirs
- Estuaries
- Rivers and Streams
- Shorelines

■ State Regulated Freshwater Wetlands  
(Outside of the Adirondack Park)

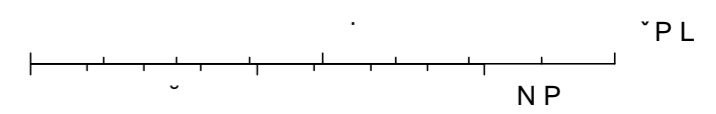
■ State Regulated Wetland Checkzone

### Significant Natural Communities

- Significant Natural Communities
- Natural Communities Near This Location
- Rare Plants or Animals

### National Wetlands Inventory

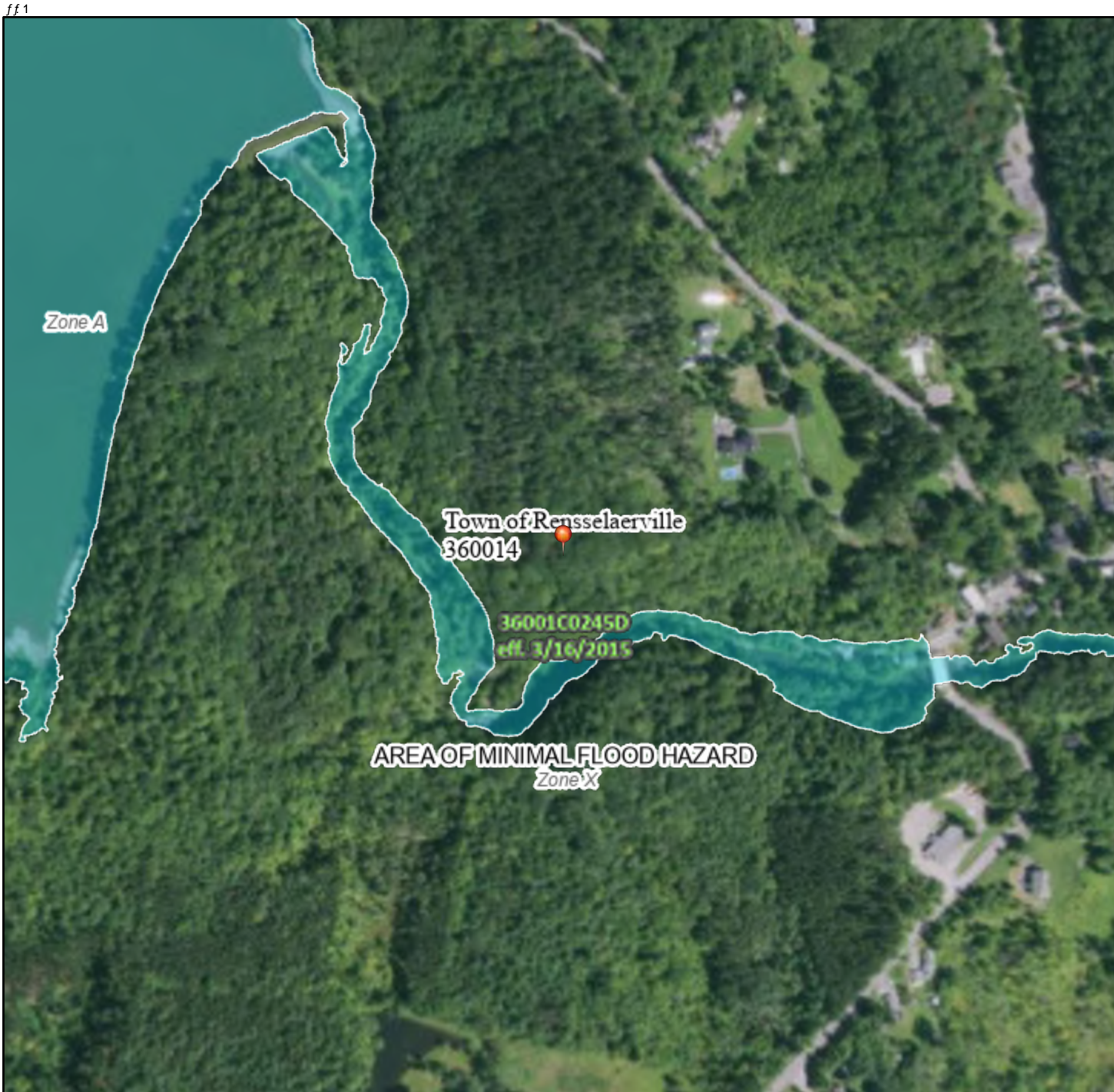
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine



(VUL & DQDGD (VUL +(5( \*DUPLQ ,1&5(0(17  
86'\$

1<6 'HSDUWPHQW RI (QYLURQPHQV  
1RW D OHJDO GRF





Legend

- Zone A: LWRW %DVHJRRGPHYDMLRQ % -FCH\$ 9 \$
- Zone X: LWK%RUFBWK -FCH\$ 2-3-4 \$
- Other: \$HODMVRUJRRG

Zone A

- \$000 &00FHJRRG-EPUG \$JHD/ R 0000 F00FHJRRGZWKDHUDH G-8WKOHV/WKQRQHRRW RU ZWKGDUDU DJHD/ R OHV/WKQRQHVTXUHEOHFCH;
- XWXUH&QJ.VLRO/\$000 &00FHJRRG-EPUG -FCH;
- \$JHZWK&GTHGJRRG&LNGHWR HHH GH RVHV -FCH;
- \$JHZWKJRRG&LNGHWRHHH -FCH'

Zone X

- \$JHD QLEO JRRG-EPUG -FCH;
- (HFWLYHV
- \$JHD &GWHUEQGJRRG-EPUG -FCH'
- &000-D &OYHUW RU &VRUR&ZU
- ||||| HHHLNH RU JRRG000

- &JRV &FVLRQ/ ZWK\$000 &00FH
- DVHU &UIDFH OHYDMLRQ
- &FDWDD 7UDQFW
- ~~~~~ %DVHJRRGPHYDMLRQLQ %
- == LEW R &VXG
- XULVLFVLRQ%&QJEDU
- &FDWDD 7UDQFW %DHLQH
- - - &JURLOH%DHLQH
- == &JURD&LFJ-DVXUH

- LJLWDD DWD\$DLEOH
- RLJLWDD DWD\$DLEOH
- &EBSG

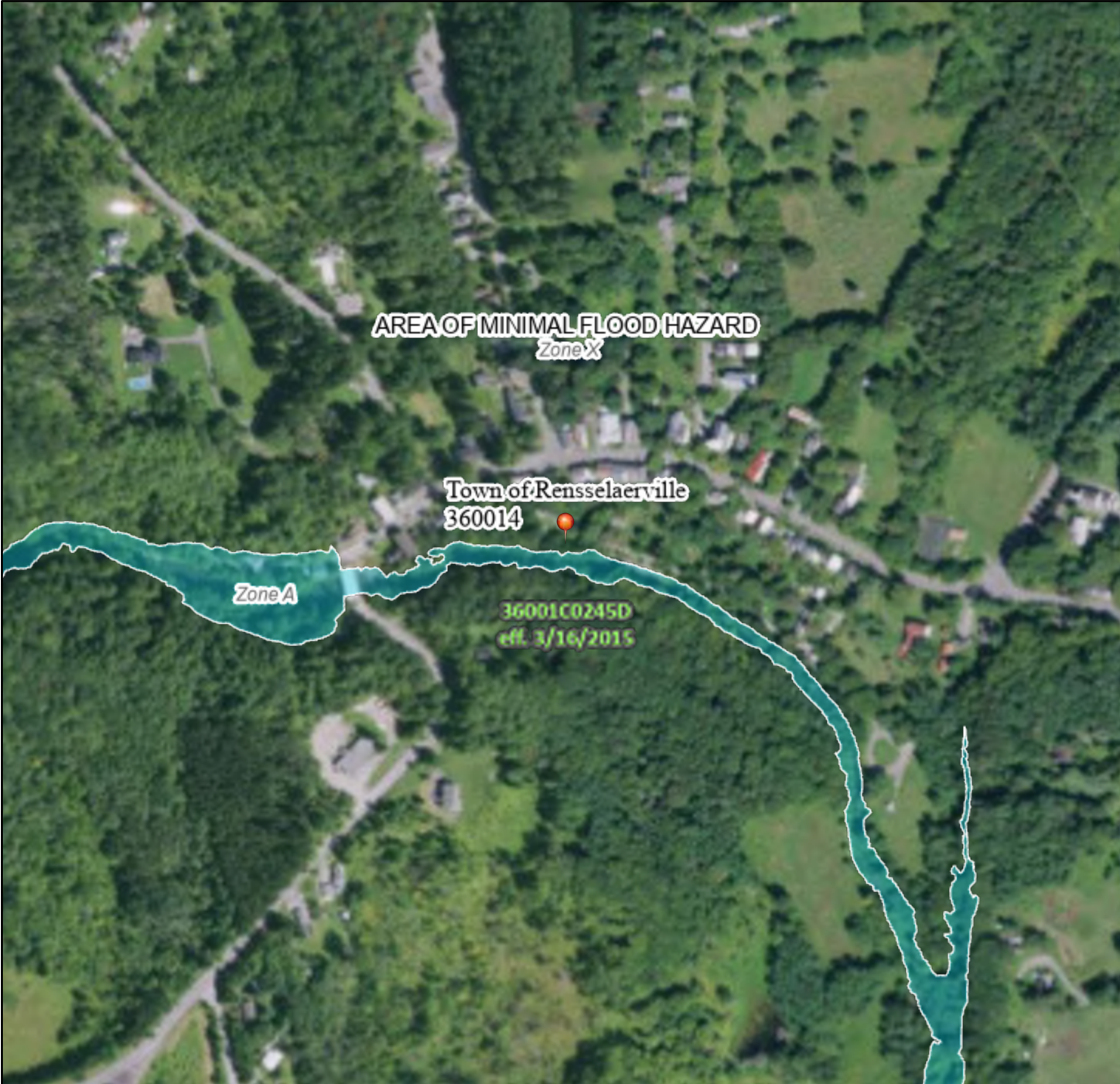
Location Pin: 7KHS.QG.VSDHGRQWKHBSLV/DQD&JL&BWH SRLQV VHOHFWHG&EWHXHU DQGGRHV CRW UH&UH DQD&WKRLWDLVHYSUR&UW&ORFDMLRQ

7KLV ESFF&DLHV ZWK&JV WDD&EUG/IRU WKHXHR GLJLWDD IOFR&ES/LI LW LV CRW YRLGDV G&FVLE&G&ORZ 7KHED&ESV&R&FF&DLHV ZWK&JV ED&ES DFXUR WDD&EUG/

7KHIOFR&K&JUGLQR&B&MLRQLV GHULYHGGLUHFWO&IUR&WKH D&WKRLWDLVHYSUR&UW&VLRQ&G&E& 7KLV ES ZV H&RUW&HG&RQ DV \$ DQGGRHV CRW UHO&FW F&Q&HV RU D&Q&Q&V V&E&H&X&Q&V WRW&LV G&DVH&D&G W&L&R 7KH&D&G&H&I&F&W&Y&L&Q&R&B&MLRQ&B&F&Q&H&RU E&F&F&V&S&U&V&G&E&Q&Z&D&V&R&Y&H&W&L&R

7KLV ES&L&B&HLV YRLGLI WKH&R&H&RU RUHR WKH&IRO&R&Z&Q&ES HO&F&Q&V GR&CRW D&S&DU ED&ES&L&B&H&U IOFR&G&R&H&O&D&E&OV OH&F&G V&D&D&E&U ES&F&U&D&MLRQ&D&MVH F&R&Q&W&L&G&Q&ML&L&H&V )&S&Q&D&Q&E&H&U D&G&G&H&I&F&W&Y&H&G&D&VH D&S&L&B&H&V IRU X&E&S&G&D&G&X&R&G&U&Q&J&G&D&J&H&V F&Q&R&V E&H&X&G&IRU U&H&O&D&M&R&U&S&U&R&V

ff1



Legend for flood zones and features:

- Zone X:**
  - Light blue: LWHRW %DVHJDRRG OHYDLRQ % -FCH\$ 9 \$
  - Light orange: LWK%RUHFWK -FCH\$ 9 \$ 9 \$
  - Red diagonal lines: \$HODWRLUJDRRQ
- Zone A:**
  - Orange: \$DQD \$DQDHJDRRG EPUG \$JHD/ R DQDQ FQDHIORRGZWKDHUDH G\$WKOHV WQDQRHRRV RU ZWKDULDQ DJHD/ R OHV WQDQRHVXDUHEOH#CH;
  - Grey diagonal lines: XWXUH\$QGLVLRQ/\$DQD \$DQDHJDRRG EPUG -FCH;
  - Orange diagonal lines: \$JHZWK\$G\$HJDRRG\$VNGHWR HHH \$H RVHV -FCH;
  - Yellow diagonal lines: \$JHZWKJDRRG\$VNGHWRHHH -FCH;
- Other Features:**
  - Blue outline: \$JHD QLEO JDRRG EPUG -FCH;
  - Light orange: \$JHD \$GWHUHQ\$JDRRG EPUG -FCH;
  - Black dashed line: \$DQD \$OYHUW RU \$VRUR#ZU
  - Black dotted line: HHHLNH RU JRRGDO
  - Black line with circle: \$JRW \$FWLRQ/ ZWK\$DQD \$DQDH DVHU \$UIDFH OHYDLRQ
  - Black dashed line: \$DQD 7UDQFW
  - Black wavy line: %DVHJDRRG OHYDLRQLQ %
  - Red line: LEW R \$VXG
  - Yellow line: -XULVLFVLRQ%\$DQD
  - Black dashed line: \$DQD 7UDQFW %DQDLQ
  - Blue dashed line: \$JRLQH%DQDLQ
  - Blue solid line: \$JURD\$LFJ\$DVXUH
  - Green grid: L.L.WDQ DWD\$DQDLQ
  - Green grid: RL.L.WDQ DWD\$DQDLQ
  - Green cross: \$DSSG
  - Red dot: 7HSLQGLVSDQGRQWKH\$BVLV DQD\$JURD\$BWH SRLQV VHOHFWHG\$WKH\$XHU DQGGRV GRW UH\$UH DQD\$WKULWDWL YH\$JUR\$UW O\$F\$DLRQ

7KLV \$B\$B\$DHLV ZWK\$J\$V WQDQDUG/ IRU WKH\$XHR GLJLWDD IO RRG\$B/LI LW LV GRW YRLGDV GHVULB\$G\$B\$ORZ 7KHEDV\$B\$V\$K\$D\$B\$DHLV ZWK\$J\$V EDV\$B\$ DFXUR WQDQDUG/

7KHIO RRGKQDUGLQRUBMLRQLV GHULYHGGLUHFWO IU\$R\$WK DV\$WKULWDWL YH\$ZEVHUYL\$FV SURLG\$G\$B\$ 7KLV \$B\$ ZV H\$RUVHGRQ DV \$ DQDGRV GRW UHOHFW FQDHV RU DQDGRV V\$B\$H\$Q/V WRWKLV GDVH DQD WLF 7KH\$DQDGH\$H\$F\$WL\$YHLQRUBMLRQ\$B\$FQDHRU B\$F\$F\$V\$H\$V\$G\$G\$E\$Q\$Z\$D\$V\$DR\$YH WLF

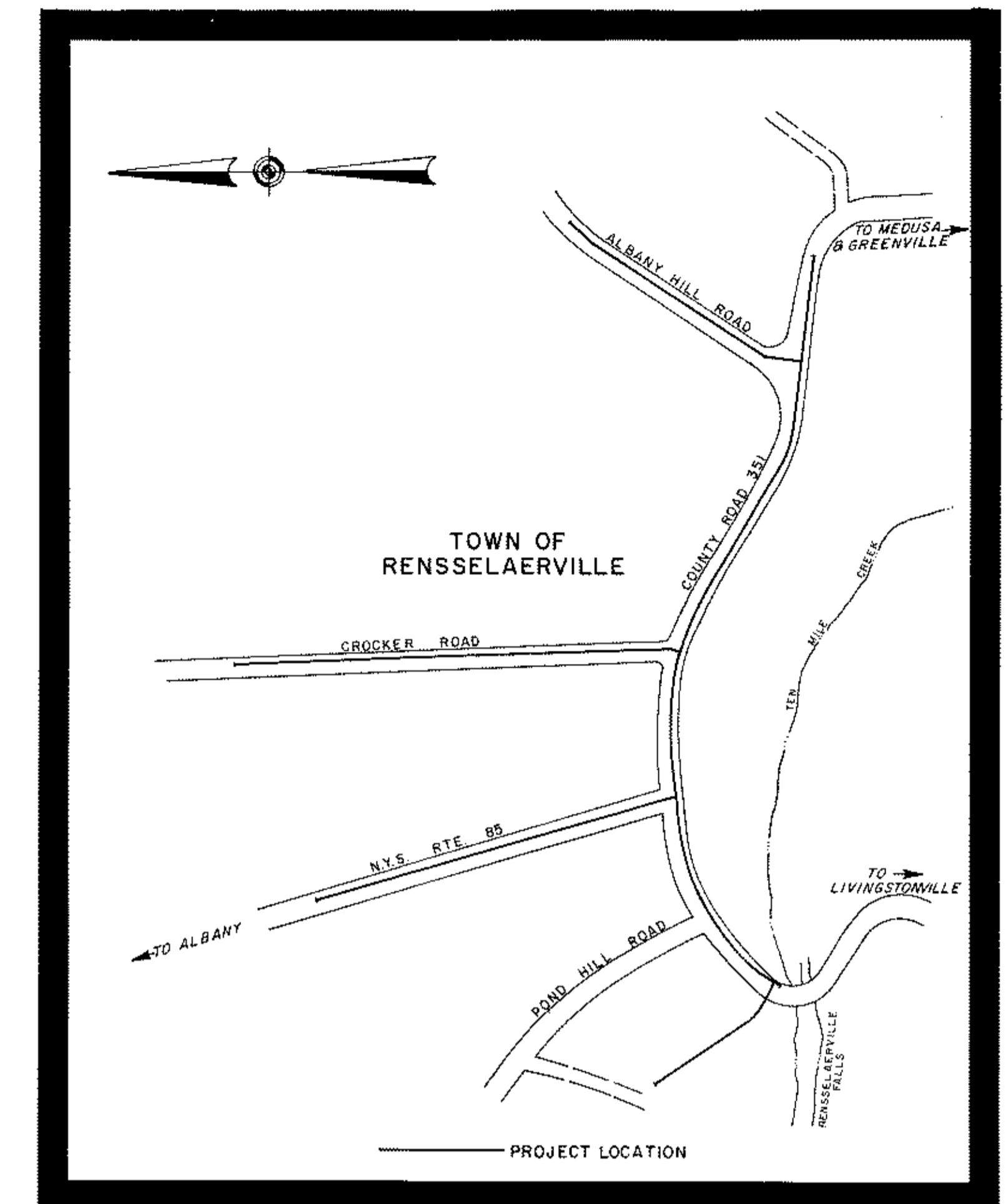
7KLV \$B\$B\$DHLV YRLGLI WKH\$R\$RU RUHR WKHIO\$R\$Z\$Q\$B\$ HO\$H\$Q\$V GR\$GRW D\$B\$DU EDV\$B\$B\$H\$ IO RRG\$R\$H\$O\$D\$H\$OV OH\$H\$G V\$D\$D\$EDU \$B\$F\$H\$D\$WL\$R\$Q\$D\$VH\$F\$R\$W\$L\$G\$D\$V\$L\$H\$U\$V )\$D\$D\$H\$O\$Q\$H\$U DQD\$G\$H\$H\$F\$WL\$YH\$G\$VH D\$B\$H\$IRU X\$B\$B\$G DQD\$X\$R\$G\$U\$Q\$J\$G\$D\$H\$V FQDGRV B\$H\$X\$G\$IRU UH\$K\$D\$W\$RLU\$S\$UR\$V\$H

APPENDIX B  
EXISTING SYSTEM INFORMATION

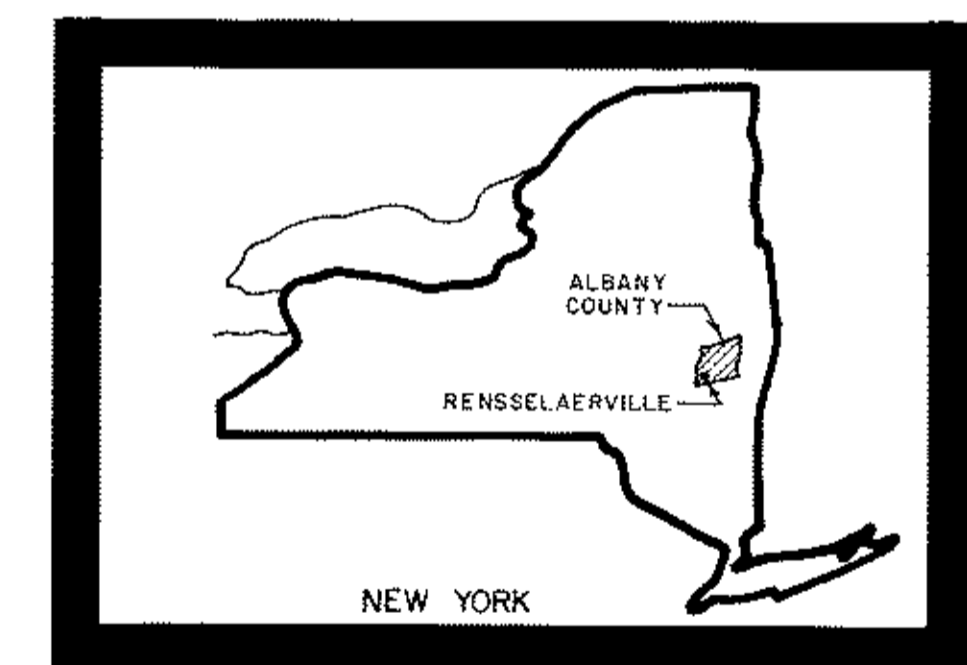
# WATER SYSTEM IMPROVEMENTS

## CONTRACT NO. 1 NEW DISTRIBUTION SYSTEM


### TOWN OF RENSSELAERVILLE ALBANY COUNTY, NEW YORK




SITE LOCATION MAP  
SCALE



ATLAS LOCATION MAP

  
C. T. MALE ASSOCIATES, P. C.  
3000 TROY ROAD, SCHENECTADY, N. Y. 12309  
518 785-0976

PROFESSIONAL ENGINEERS    LAND SURVEYORS    LAND PLANNING CONSULTANTS  
COMPUTER SERVICES    LANDSCAPE ARCHITECTURE    LABORATORY SFP, CES

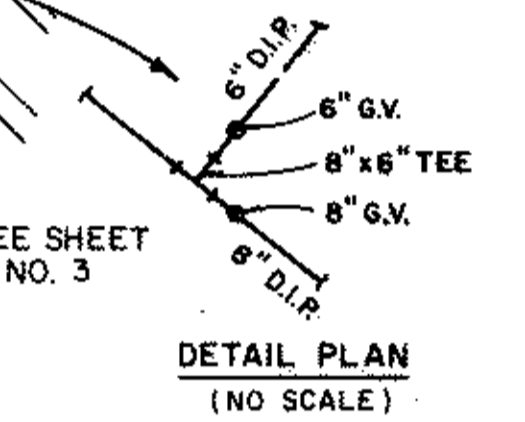
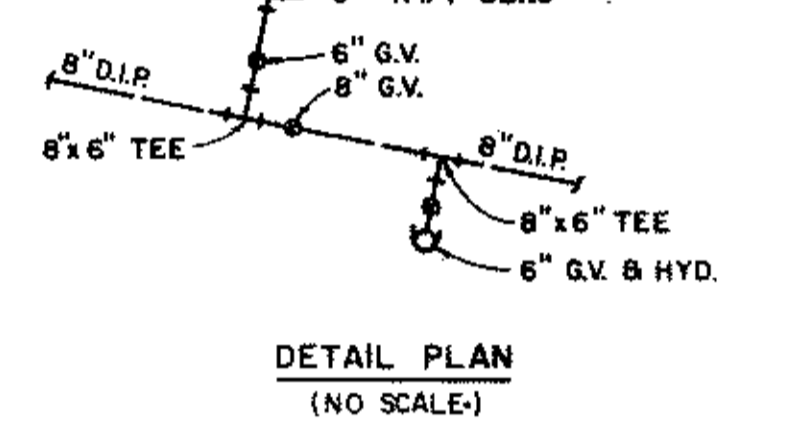
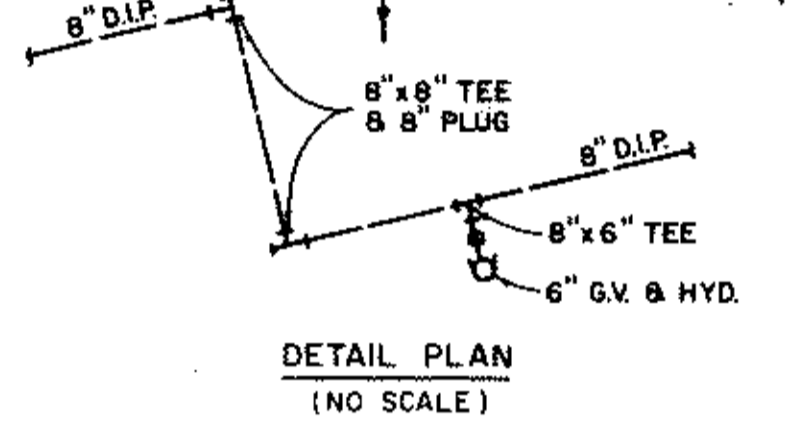
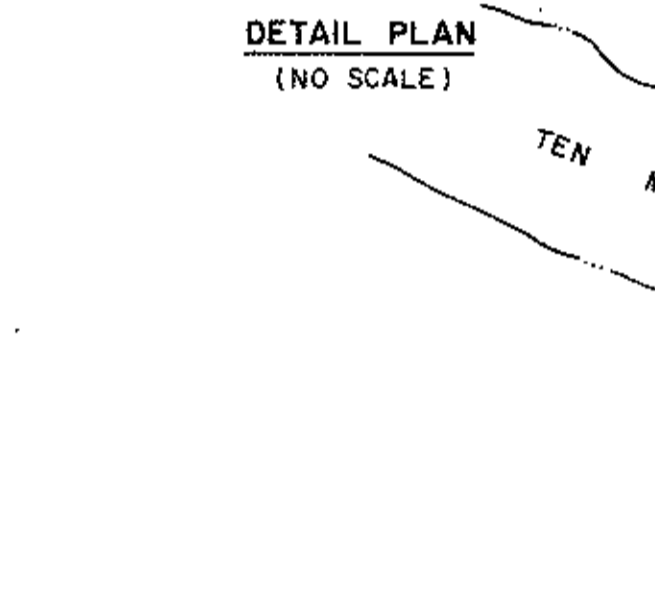
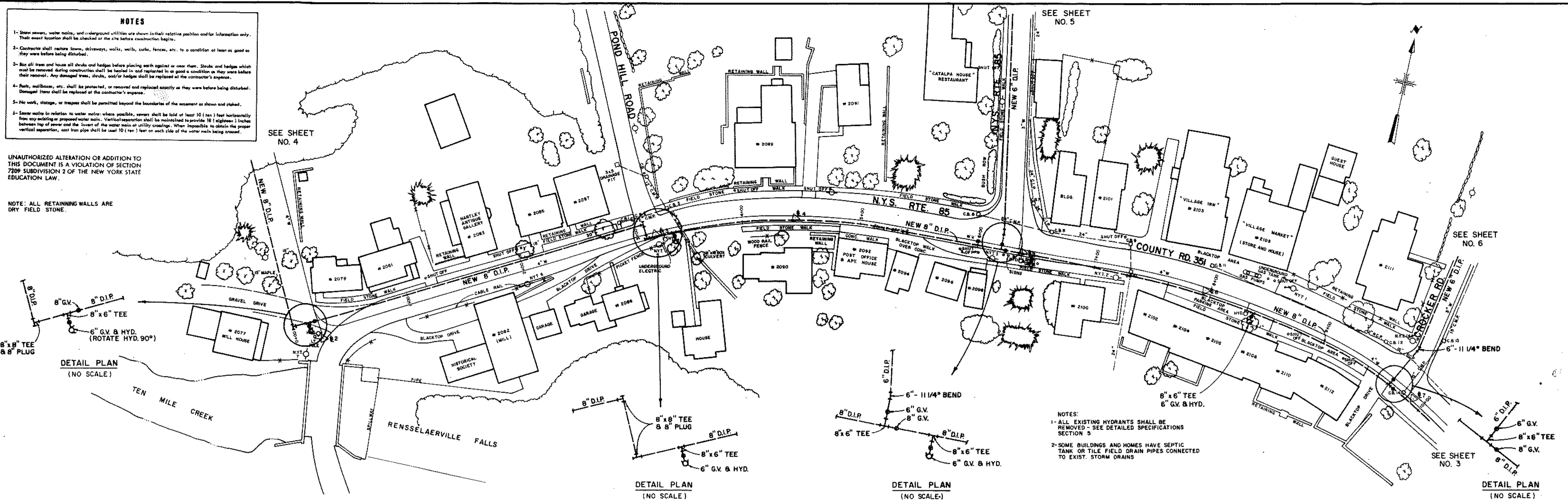
  
Drawing No. 80-85  
Date MAY 2, 1980  
Sheet 1 of 10

**NOTES**

- 1- Storm sewers, water mains, and underground utilities are shown in their relative position and for information only. Their exact location shall be checked at the site before construction begins.
- 2- Contractor shall restore lawns, driveways, walks, wells, cists, fences, etc. to a condition at least as good as they were before being disturbed.
- 3- Box all trees and house all shrubs and hedges before placing earth against or near them. Shrubs and hedges which must be removed during construction shall be holed in and replanted in as good a condition as they were before their removal. Any damaged trees, shrubs, cists or hedges shall be replaced at the contractor's expense.
- 4- Poles, and bases, etc. shall be protected, or removed and replaced exactly as they were before being disturbed. Damaged items shall be replaced at the contractor's expense.
- 5- No work, storage, or impound shall be permitted beyond the boundaries of the assessment as shown and stipulated.
- 6- Sewer mains in relation to water mains: where possible, sewers shall be laid at least 10 (ten) feet horizontally from any existing or proposed water main. Vertical separation shall be maintained to provide 18 (eighteen) inches between top of sewer and the invert of the water main or utility crossings. When impossible to obtain the proper vertical separation, cast iron pipe shall be used 10 (ten) feet on each side of the water main being crossed.

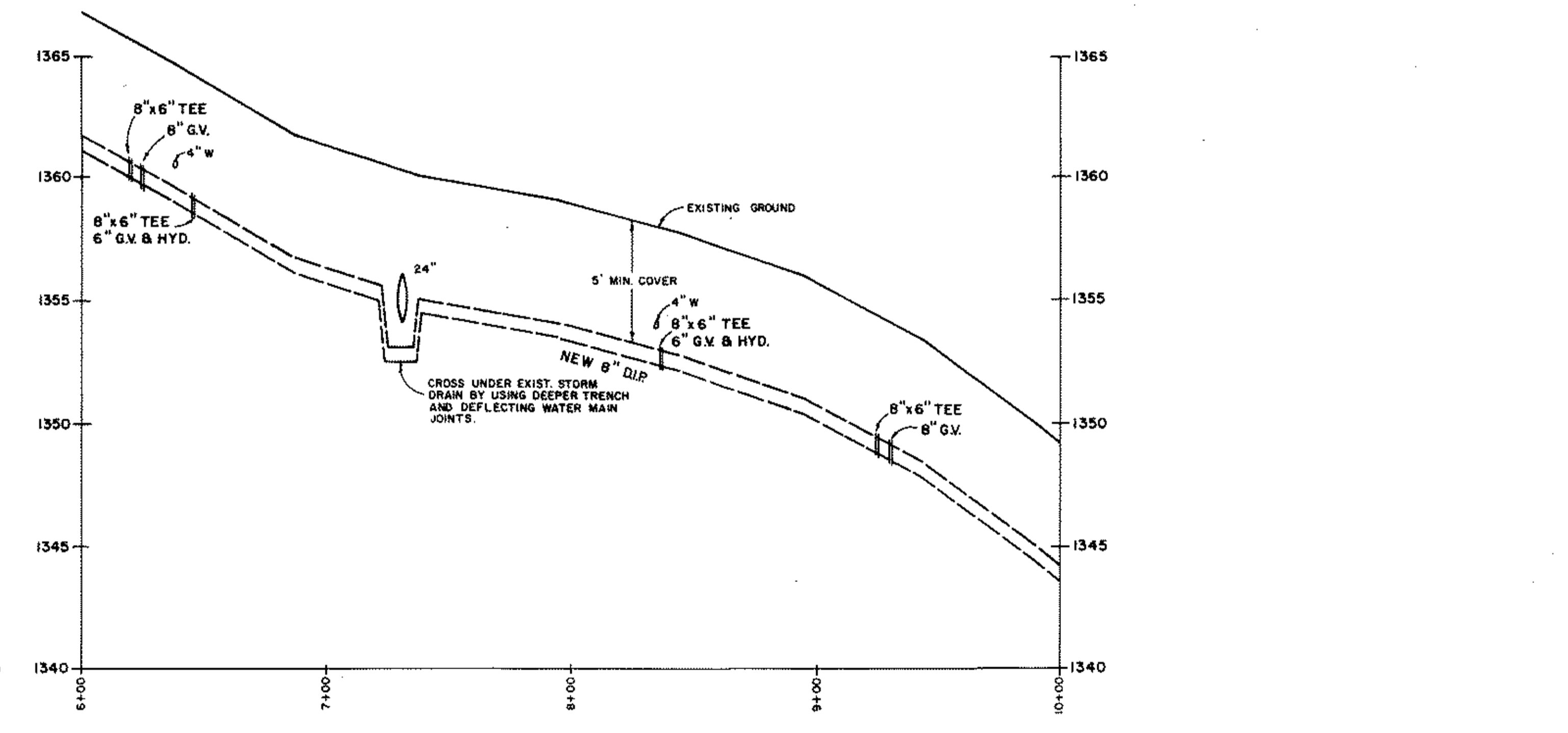
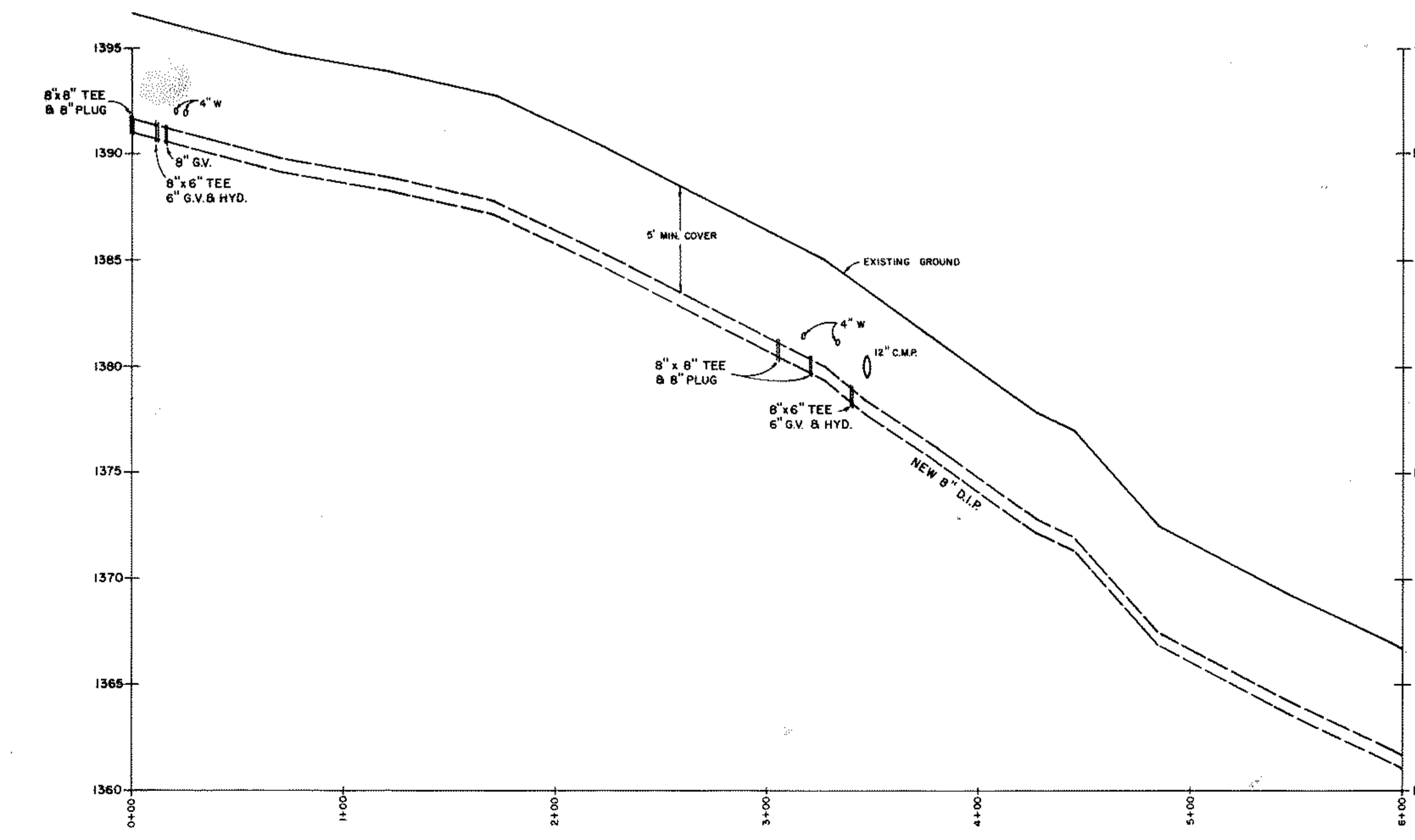
UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

NOTE: ALL RETAINING WALLS ARE DRY FIELD STONE.



**NOTES:**

- 1- ALL EXISTING HYDRANTS SHALL BE REMOVED - SEE DETAILED SPECIFICATIONS SECTION 5
- 2- SOME BUILDINGS AND HOMES HAVE SEPTIC TANK OR TILE FIELD DRAIN PIPES CONNECTED TO EXIST. STORM DRAINS



DATE	RECORD OF WORK	Drawn	Check	Appr.

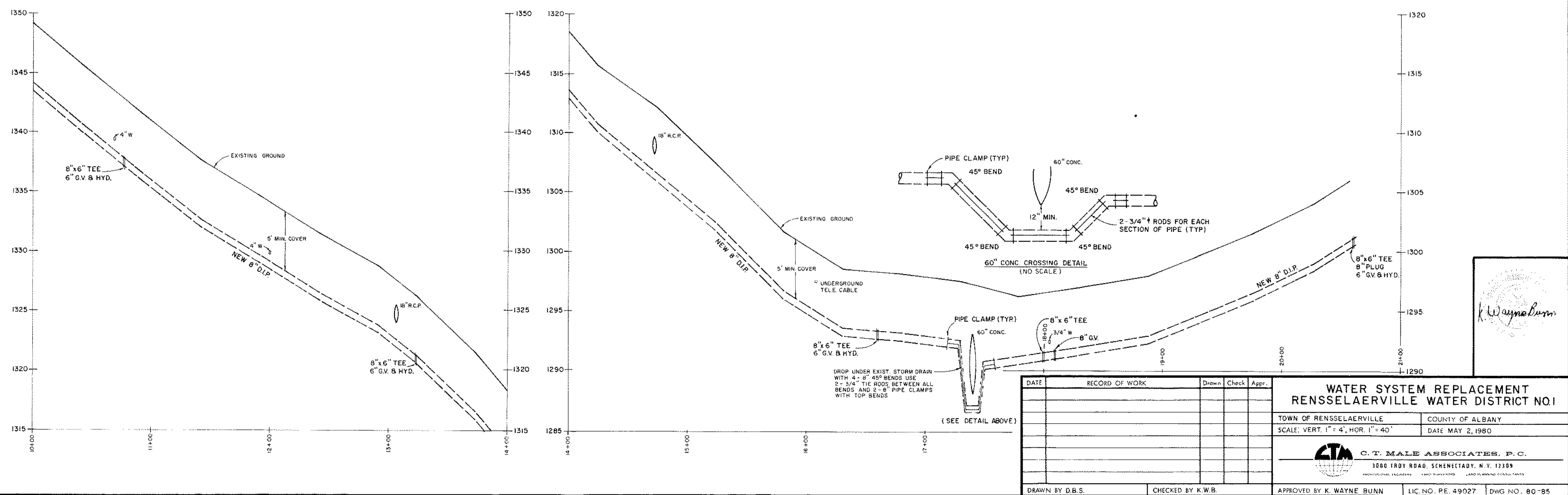
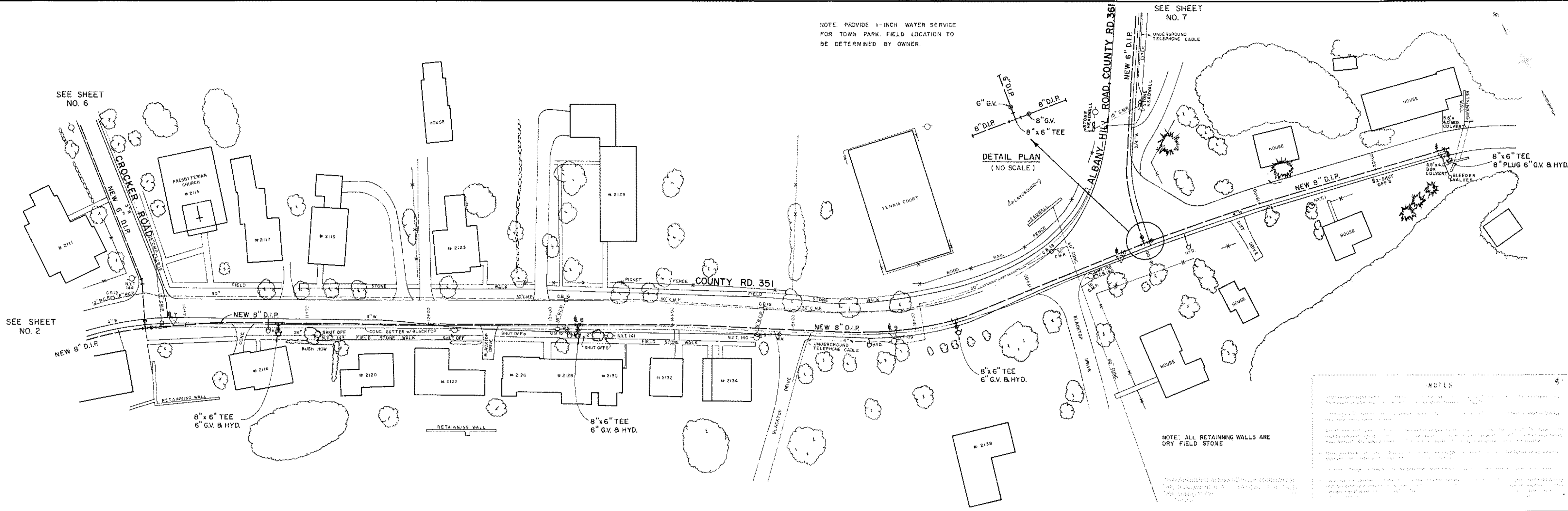
**WATER SYSTEM REPLACEMENT  
RENSSELAERVILLE WATER DISTRICT NO. 1**

TOWN OF RENSSELAERVILLE      COUNTY OF ALBANY  
 SCALE: VERT. 1" = 4', HOR. 1" = 40'      DATE MAY 2, 1980

**C.T. MALE ASSOCIATES, P.C.**  
 3000 TROY ROAD, SCENECTADY, N.Y. 12308  
 PROFESSIONAL ENGINEERS      LAND SURVEYORS      LAND PLANNING CONSULTANTS

DRAWN BY D.B.S.      CHECKED BY K.W.B.      APPROVED BY K. WAYNE BUNN      LIC. NO. P.E. 49027      DWG. NO. 80-85

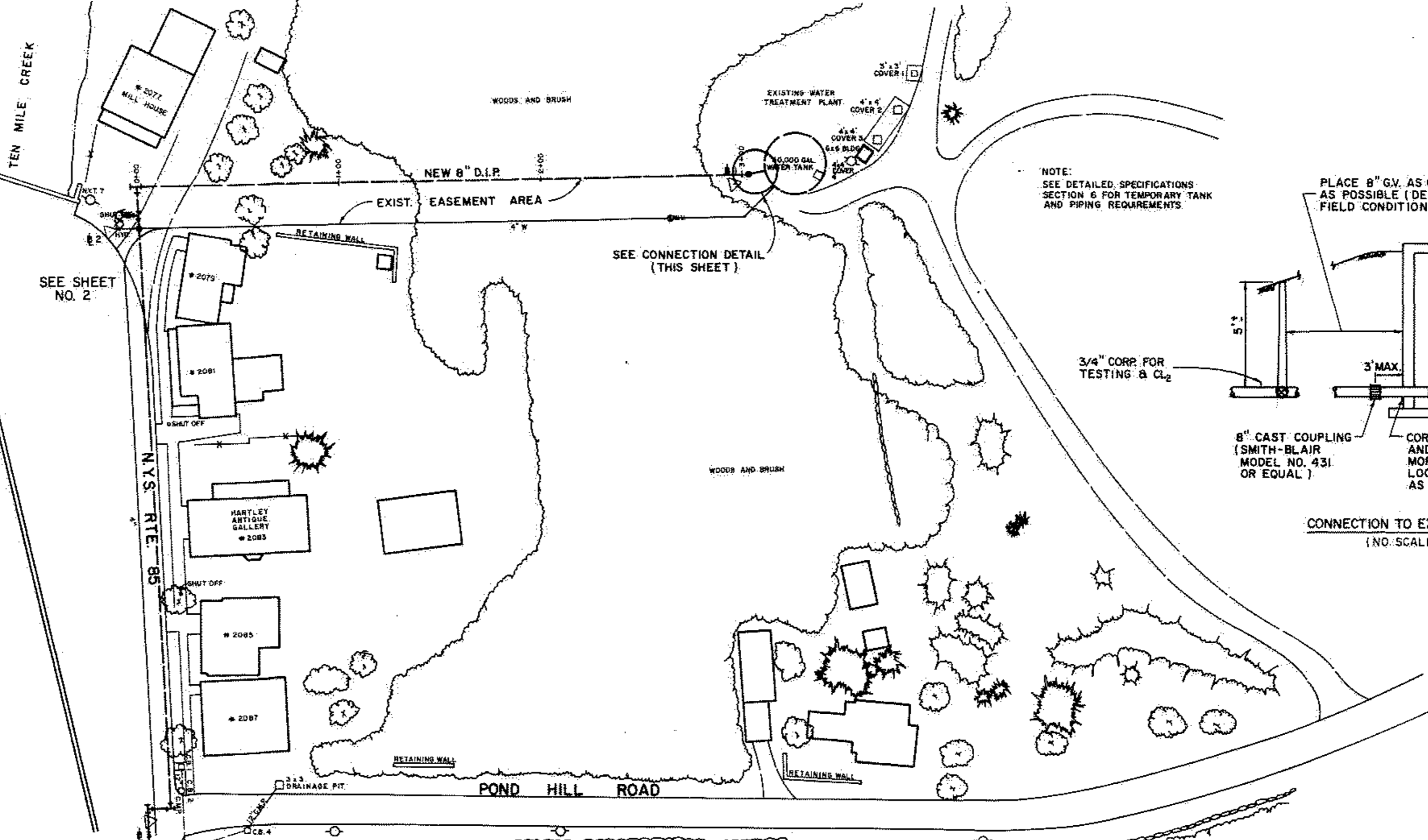
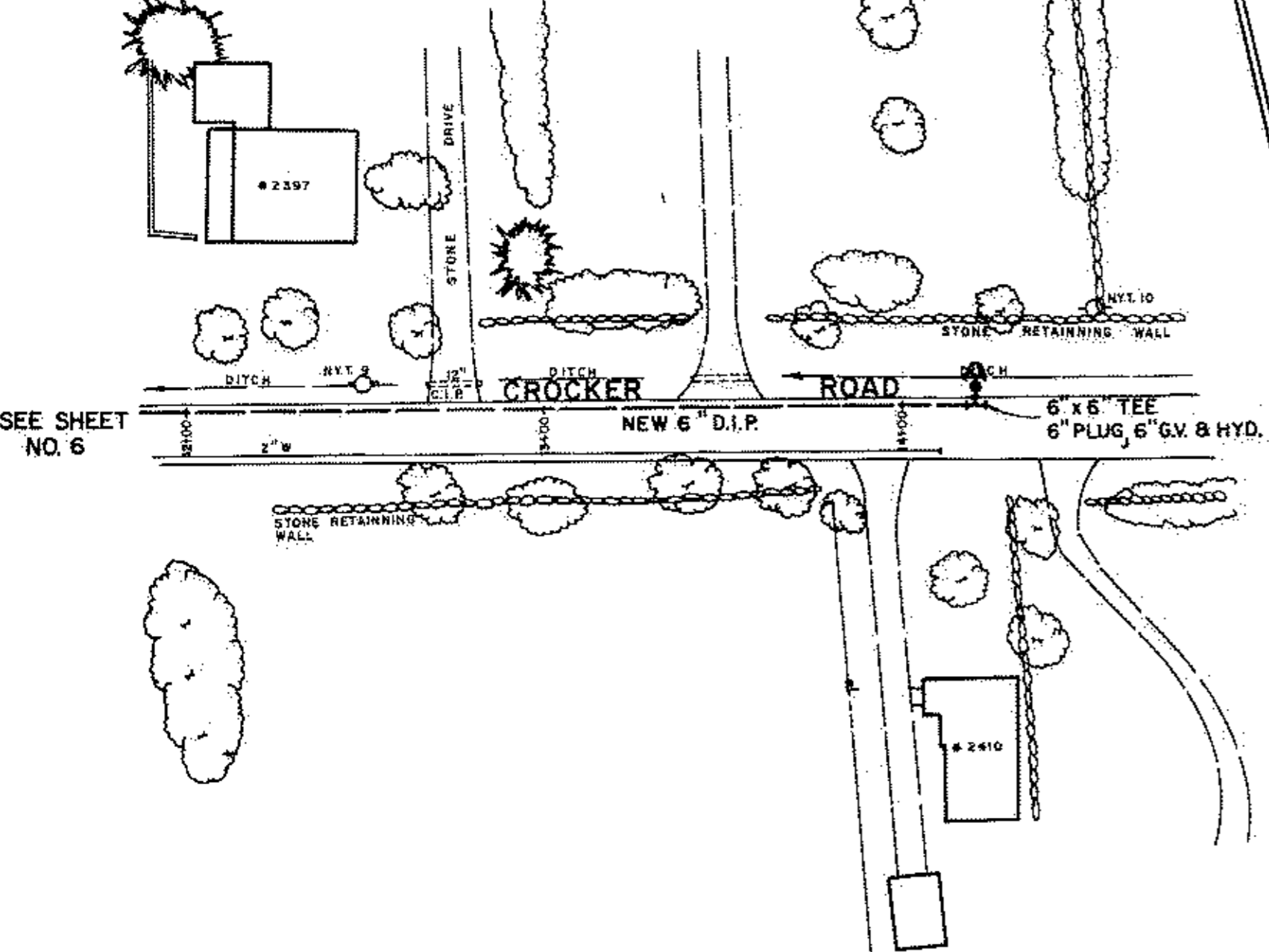
NOTE: PROVIDE 1-INCH WATER SERVICE FOR TOWN PARK. FIELD LOCATION TO BE DETERMINED BY OWNER.



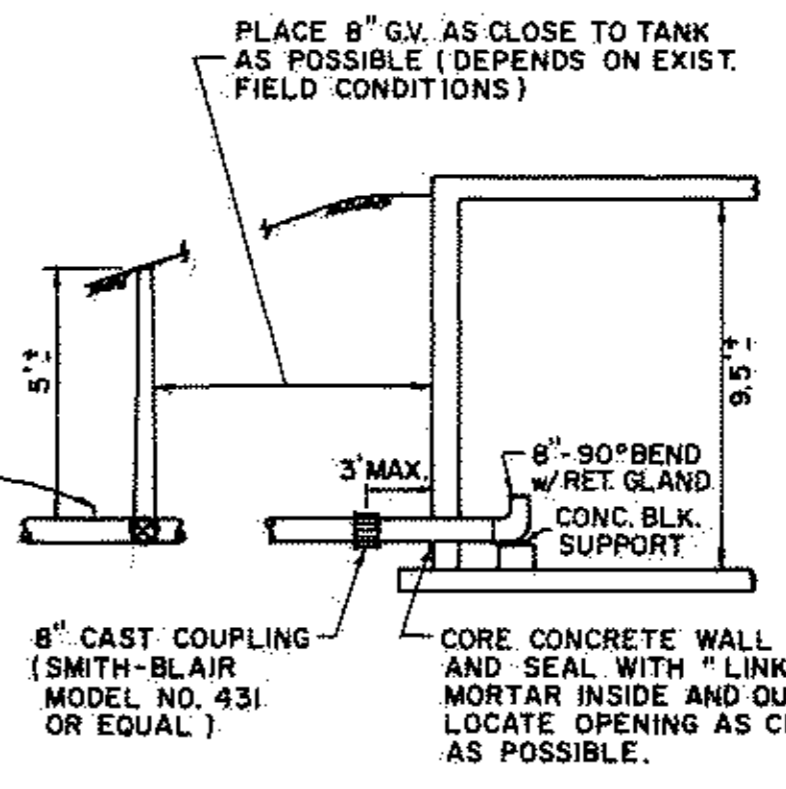
*K. Wayne Bunn*

- NOTES**
- 1- Show arrows, water mains, and underground utilities (as shown) in their relative position and for information only. Their exact location shall be checked at the site before construction begins.
  - 2- Contractor shall restore (roads, driveways, walks, walls, curbs, fences, etc.) to a condition at least as good as they were before being disturbed.
  - 3- All trees and shrubs shall be protected and replaced before placing earth or near them. Shrubs and hedges which must be removed during construction shall be located in and replaced in as good a condition as they were before their removal. Any damaged trees, shrubs, and/or hedges shall be replaced at the contractor's expense.
  - 4- Poles, masts, etc. shall be protected, or removed and replaced exactly as they were before being disturbed. Damaged items shall be replaced at the contractor's expense.
  - 5- No work, storage, or trespass shall be permitted beyond the boundaries of the easement as shown and staked.
  - 6- Sewer mains in relation to water mains where possible, sewers shall be laid at least 15 (ten) feet horizontally from any existing or proposed water main. Vertical separation shall be maintained to provide 18 (eighteen) inches between top of sewer and the inverts of the water main at utility crossings. When impossible to obtain the proper vertical separation, cast iron pipe shall be used 10 (ten) feet on each side of the water main being crossed.

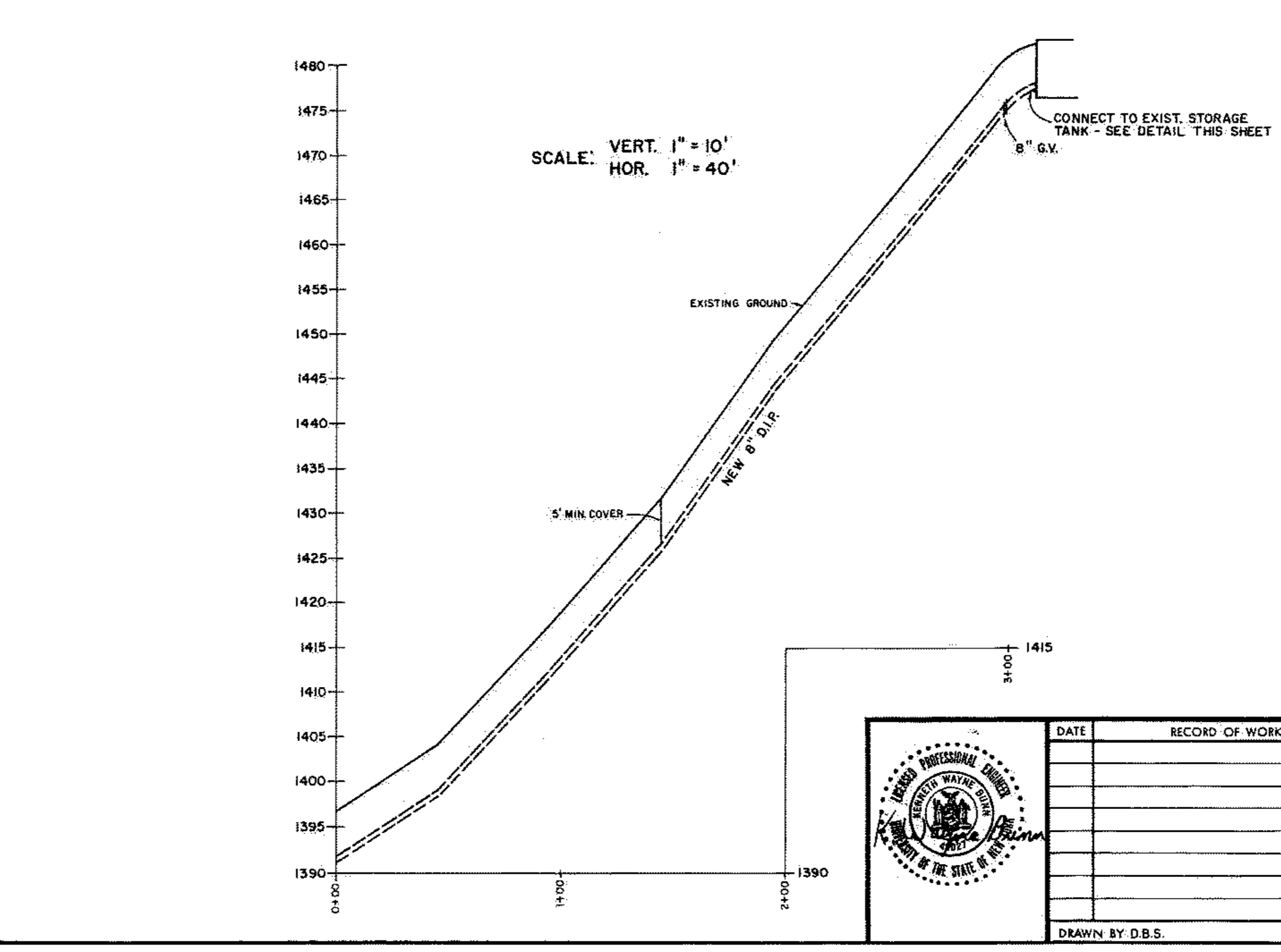
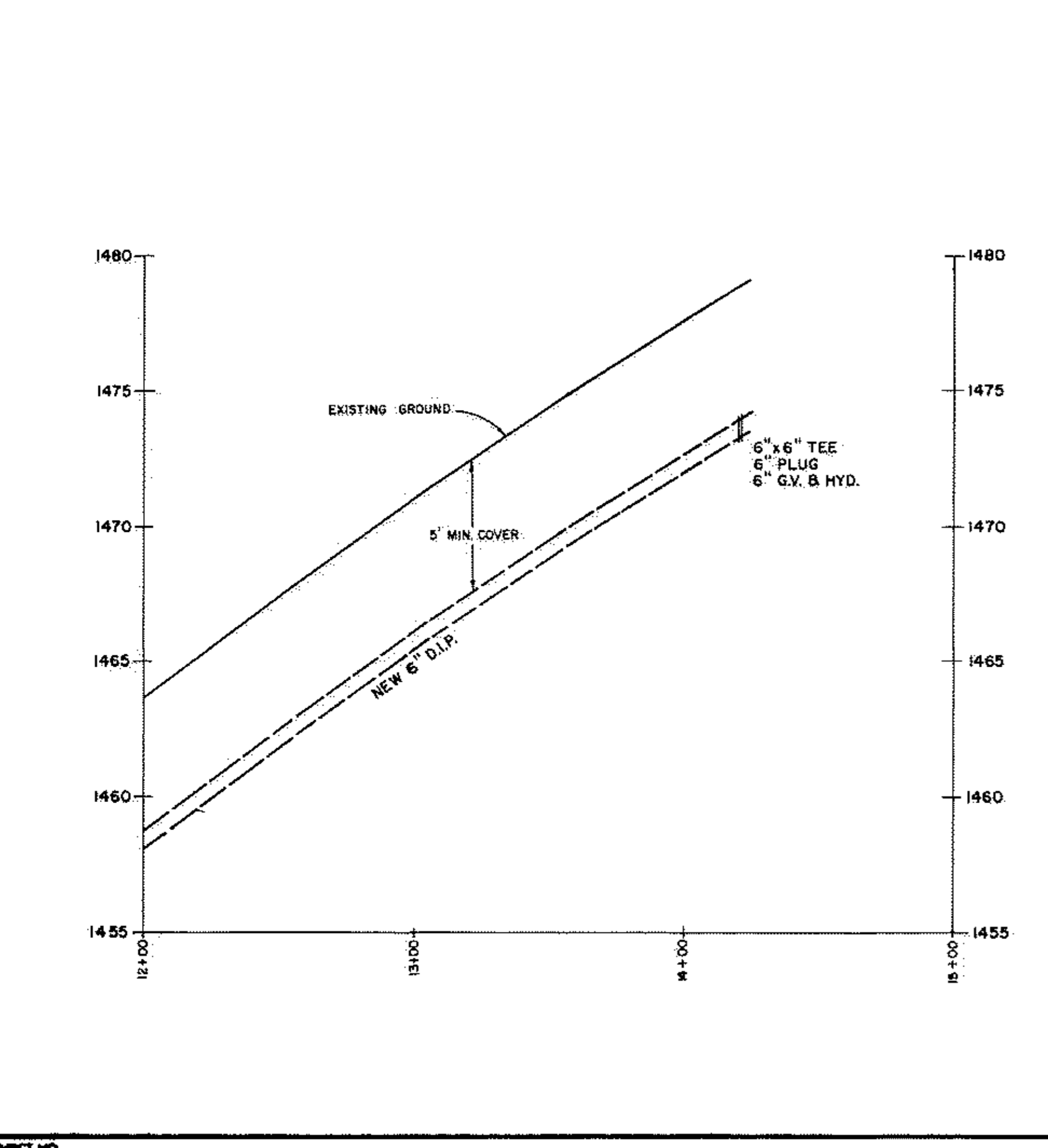
UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.



NOTE: SEE DETAILED SPECIFICATIONS SECTION 6 FOR TEMPORARY TANK AND PIPING REQUIREMENTS



CONNECTION TO EXISTING TANK (NO SCALE)



DATE	RECORD OF WORK	Drawn	Check	Appr.

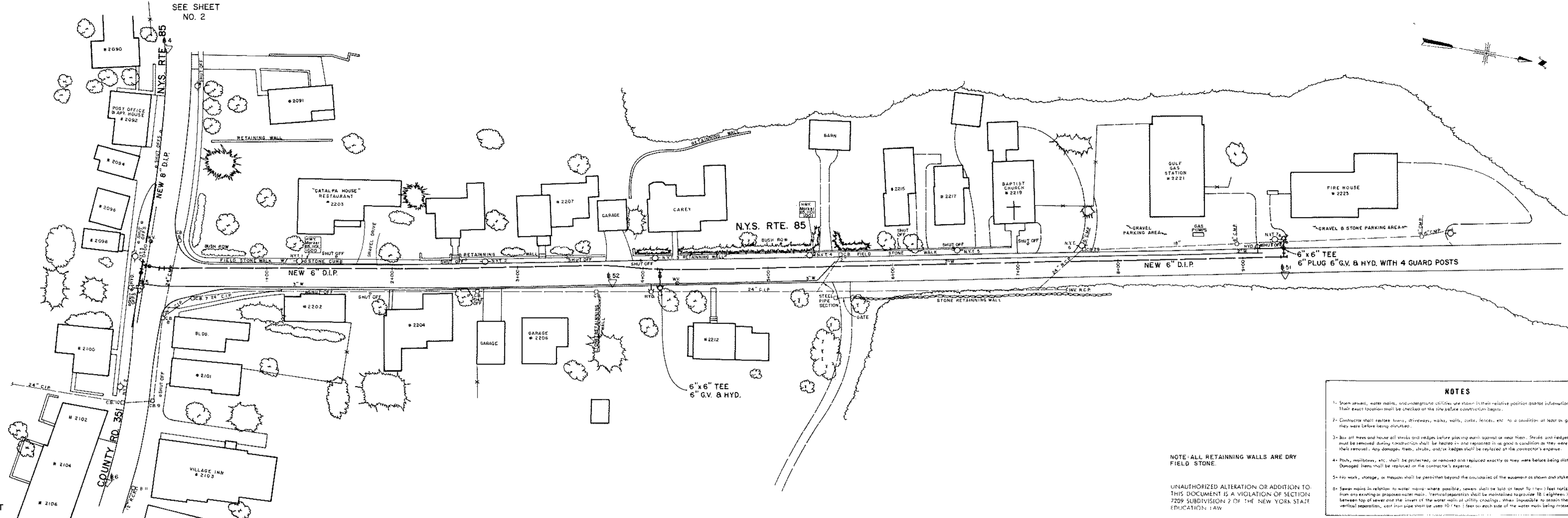
**WATER SYSTEM REPLACEMENT  
RENSELAERVILLE WATER DISTRICT NO. 1**

TOWN OF RENSSAELERVILLE      COUNTY OF ALBANY  
SCALE: AS SHOWN      DATE MAY 2, 1980

**C. T. MALE ASSOCIATES, P.C.**  
3800 TROY ROAD, SENECTADY, N.Y. 12189  
PROFESSIONAL ENGINEERS      LAND SURVEYORS      LAND PLANNING CONSULTANTS

DRAWN BY D.B.S.      CHECKED BY K.W.B.      APPROVED BY K. WAYNE BUNN      LIC. NO. P.E. 49027      DWS NO. 80-85

SEE SHEET NO. 2

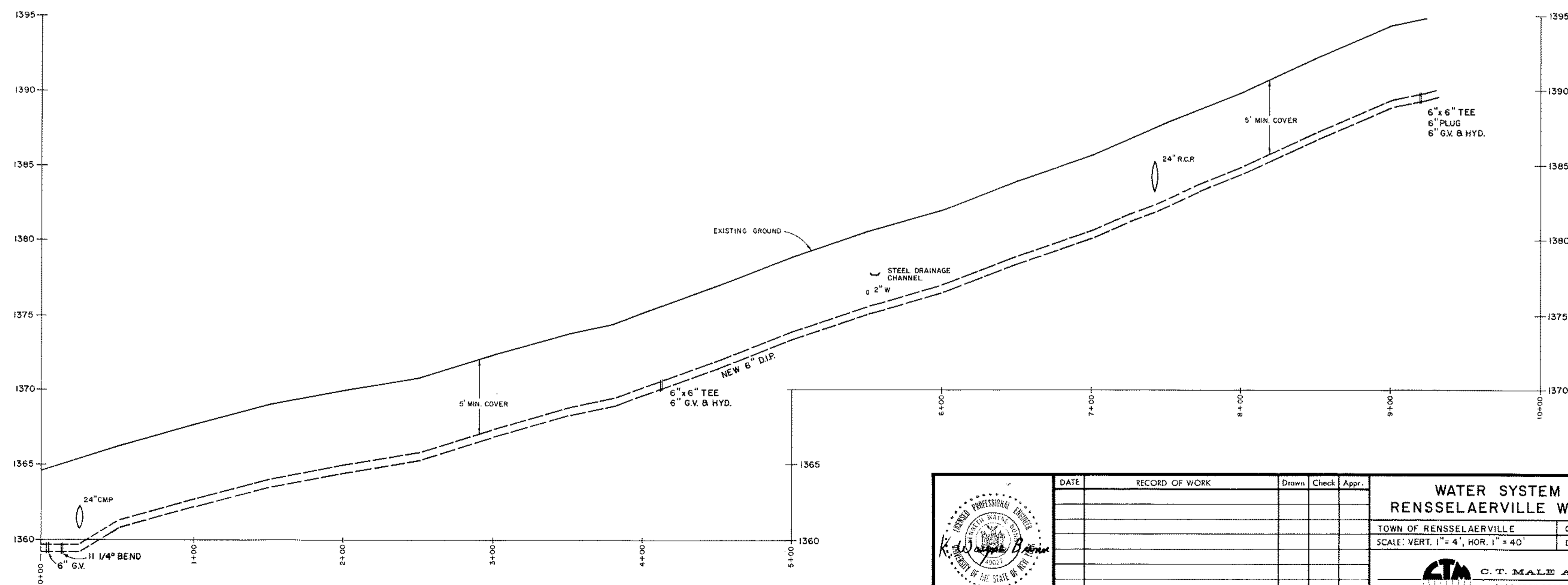


SEE SHEET NO. 2

- NOTES**
1. Show present, water main, and underground utilities, use shown in their relative position quarter information only. Their exact location shall be checked at the site before construction begins.
  2. Contractor shall replace curbs, driveways, walks, walls, fences, etc. to a condition at least as good as they were before being disturbed.
  3. Box off trees and leave all limbs and ragged before placing earth against or near them. Stubs and ragged limbs which must be removed during construction shall be kept in and replaced in as good a condition as they were before their removal. Any damaged trees, shrubs, and/or bushes shall be replaced at the contractor's expense.
  4. Poles, mailboxes, etc. shall be protected, or removed and replaced exactly as they were before being disturbed. Damaged items shall be replaced at the contractor's expense.
  5. Any work, storage, or trucks shall be prohibited beyond the boundaries of the easement as shown and stated.
  6. Sewer mains in relation to water mains where possible, sewers shall be laid at least 10 to 12 feet horizontally from any existing or proposed water main. Vertical separation shall be maintained to provide 18 to 18 inches between top of sewer and the invert of the water main or utility crossings, when impossible to obtain the proper vertical separation, cast iron pipe shall be used 10 to 12 feet on each side of the water main being crossed.

NOTE: ALL RETAINING WALLS ARE DRY FIELD STONE.

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW



DATE	RECORD OF WORK	Drawn	Check	Appr.

**WATER SYSTEM REPLACEMENT  
RENSELAERVILLE WATER DISTRICT NO. 1**

TOWN OF RENSELAERVILLE      COUNTY OF ALBANY  
SCALE: VERT. 1" = 4', HOR. 1" = 40'      DATE MAY 2, 1980

**CTM** C.T. MALE ASSOCIATES, P.C.  
3000 TROY ROAD, SCHENECTADY, N.Y. 12309  
PROFESSIONAL ENGINEERS      LAND SURVEYORS      LAND PLANNING CONSULTANTS

DRAWN BY D.B.S.      CHECKED BY K.W.B.      APPROVED BY K. WAYNE BUNN      LIC. NO. P.E. 49027      DWG. NO. 80-85

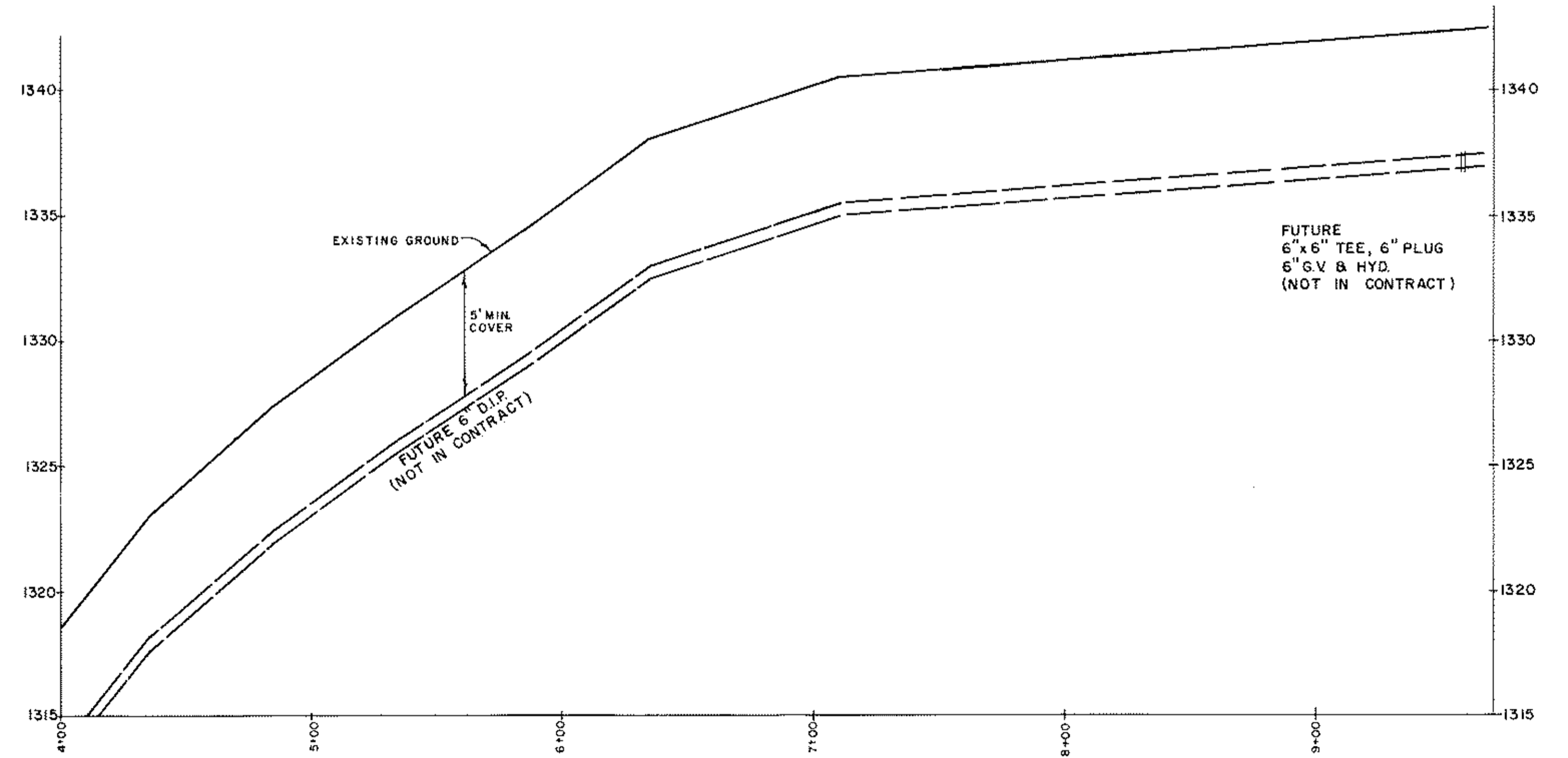
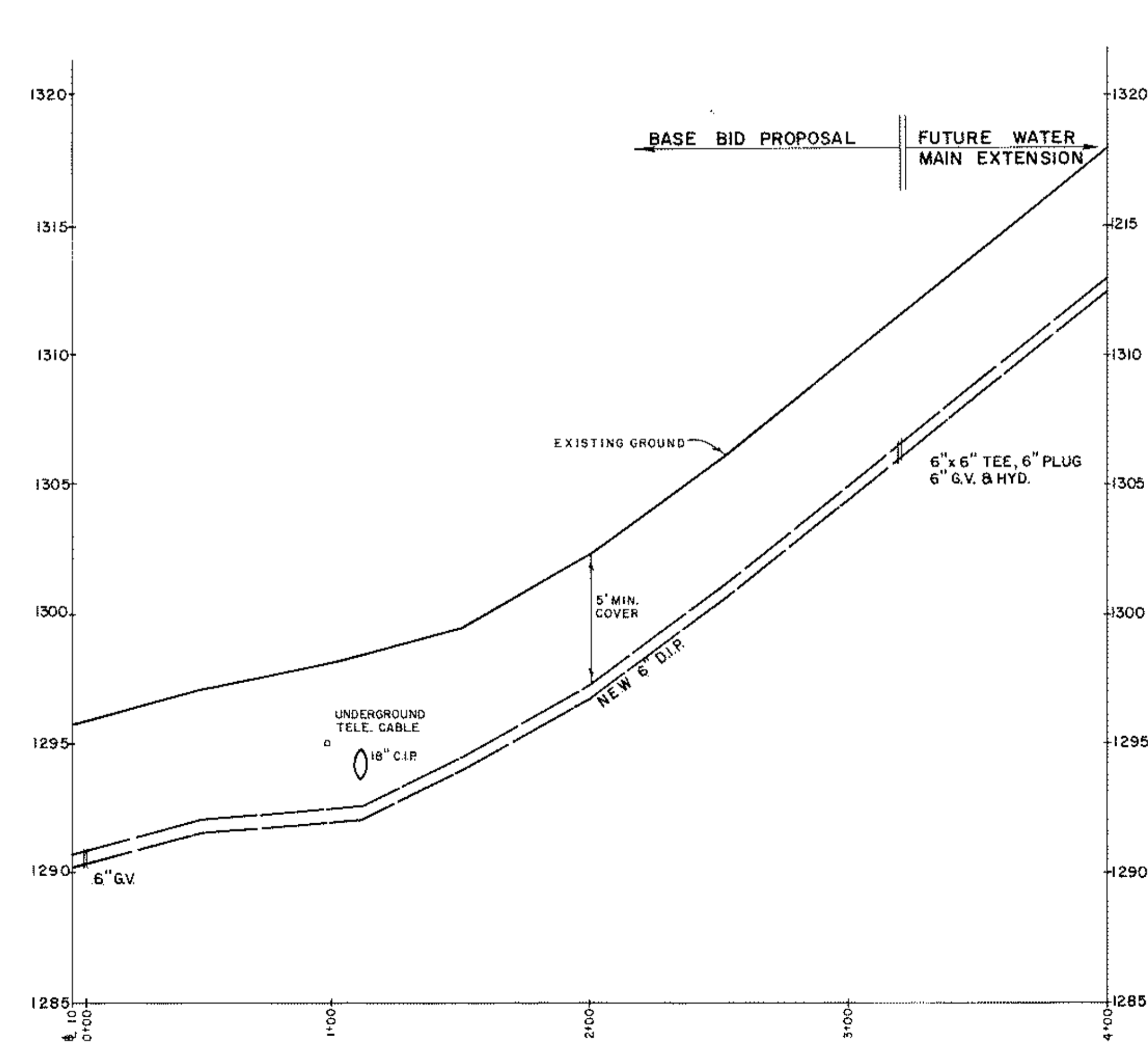
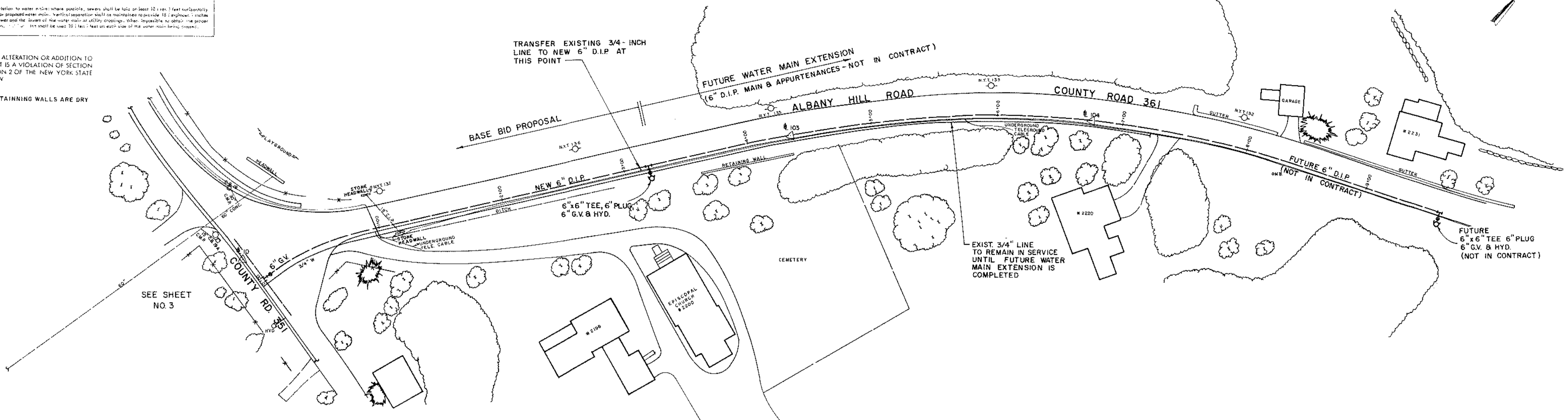


**NOTES**

- 1- Storm sewers, water mains, and underground utilities are shown in their relative positions and for information only. Their exact location shall be checked at the site before construction begins.
- 2- Constructive shall include: foundations, walls, utility trenches, etc. in a condition of 100% as shown or they were before being disturbed.
- 3- Box all trees and have all shrubs and hedges before planting with regard to their stems. Shrubs and hedges which must be removed during construction shall be located in and replanted in as good a condition as they were before their removal. Any damaged trees, shrubs, and hedges shall be replaced on the contractor's expense.
- 4- Posts, railings, etc. shall be protected, or removed and replaced exactly as they were before being disturbed. Damaged items shall be replaced on the contractor's expense.
- 5- No work, storage, or disposal shall be permitted beyond the boundaries of the easement as shown on this plan.
- 6- Sewer mains in relation to water mains: where possible, sewers shall be laid on a minimum 10% slope. 12" minimum depth from any existing or proposed water main. Vertical separation shall be maintained to provide 18" minimum clearance between top of sewer and the lowest of the water main or utility crossing. When, however, to obtain the proper vertical separation, a 12" or 18" shall be used 10 feet on each side of the water main being crossed.

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

NOTE: ALL RETAINING WALLS ARE DRY FIELD STONE.



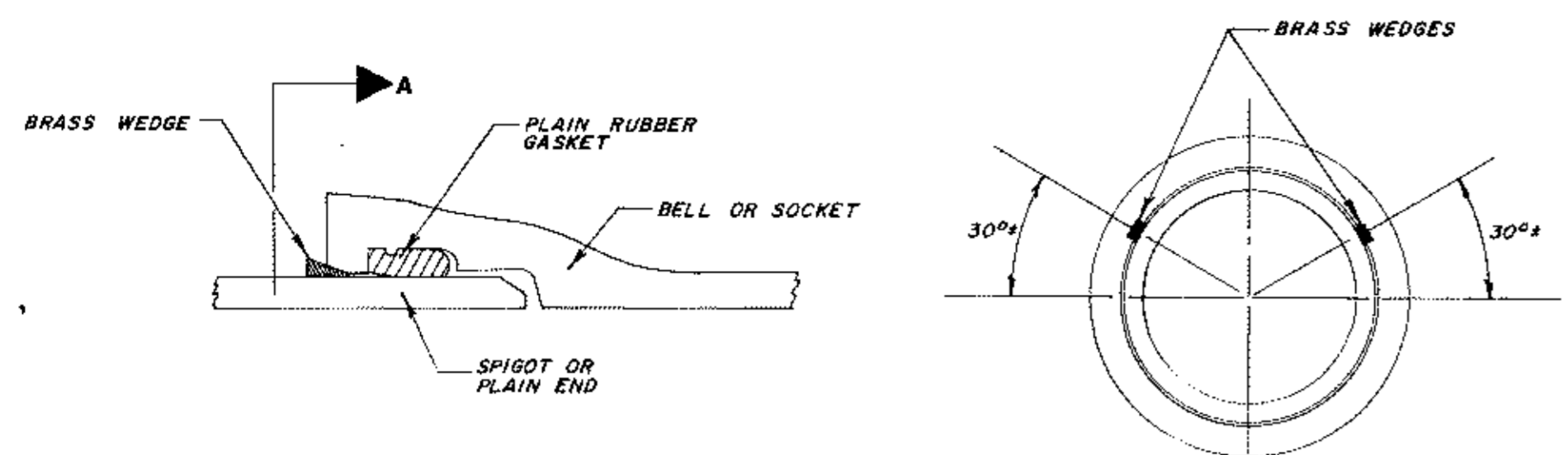
DATE	RECORD OF WORK	Drawn	Check	Appr.

**WATER SYSTEM REPLACEMENT  
RENSELAERVILLE WATER DISTRICT NO. 1**

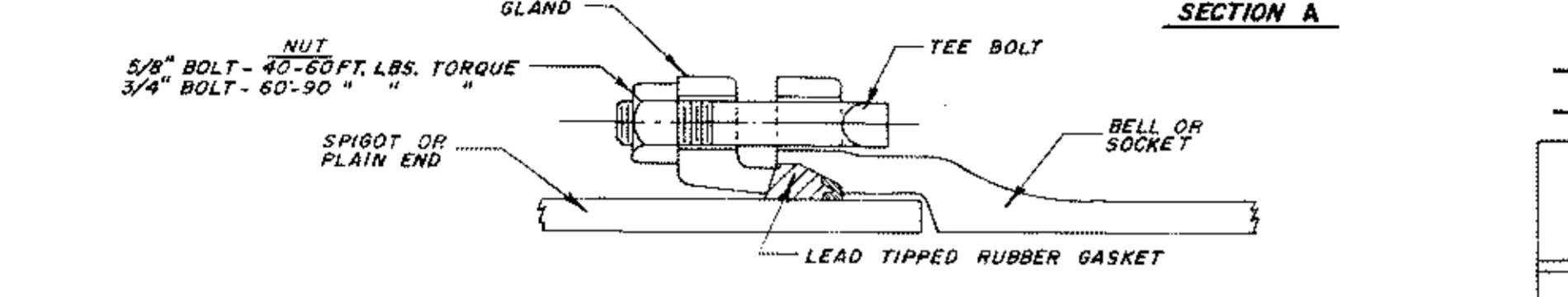
TOWN OF RENSELAERVILLE      COUNTY OF ALBANY  
 SCALE: VERT. 1" = 4', HOR. 1" = 40'      DATE MAY 2, 1980

**C.T. MALE ASSOCIATES, P.C.**  
 3888 TROY ROAD, SCHENECTADY, N.Y. 12309  
 PROFESSIONAL ENGINEERS      LAND SURVEYORS      LAND PLANNING CONSULTANTS

DRAWN BY D.B.S.      CHECKED BY K.W.B.      APPROVED BY K. WAYNE BUNN      LIC. NO. 49027      DWG. NO. 80-85

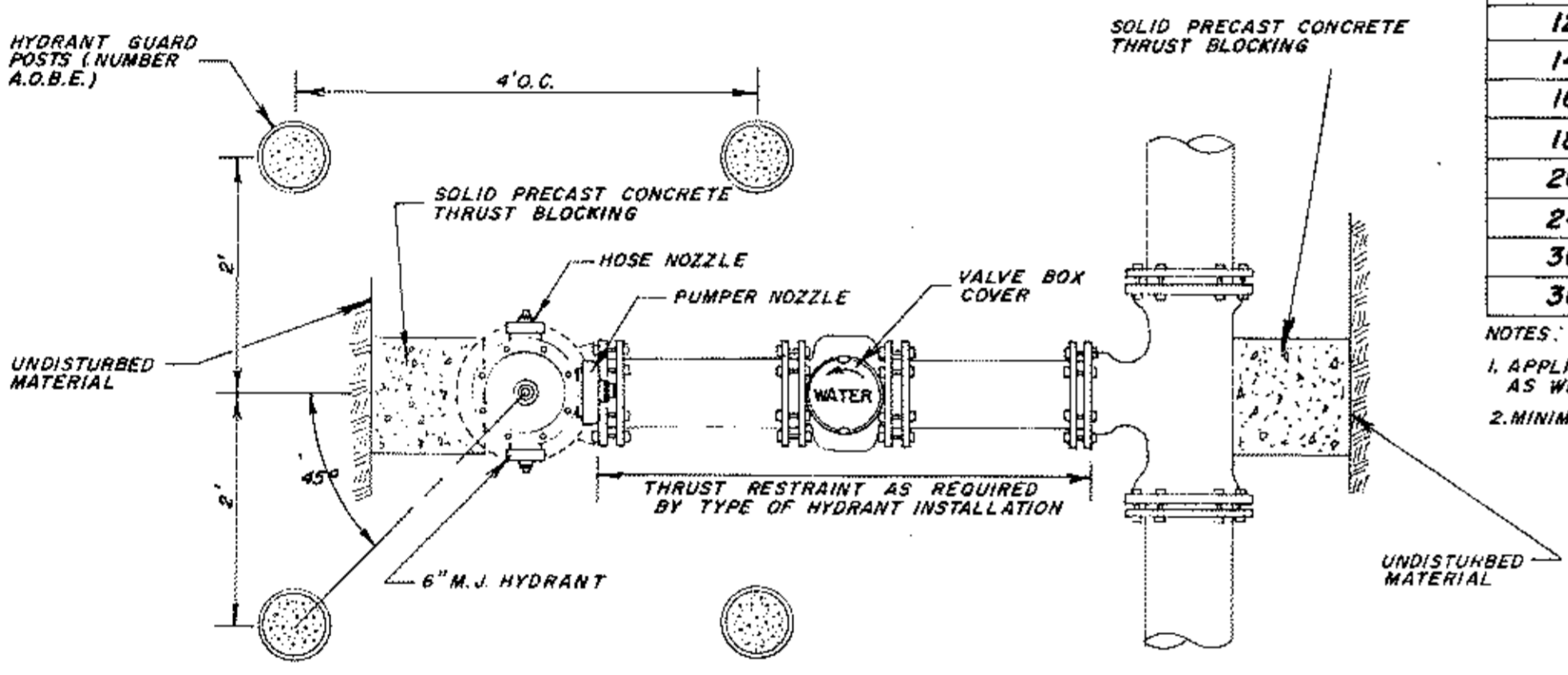


**PUSH-ON JOINT (P.O.J.)**

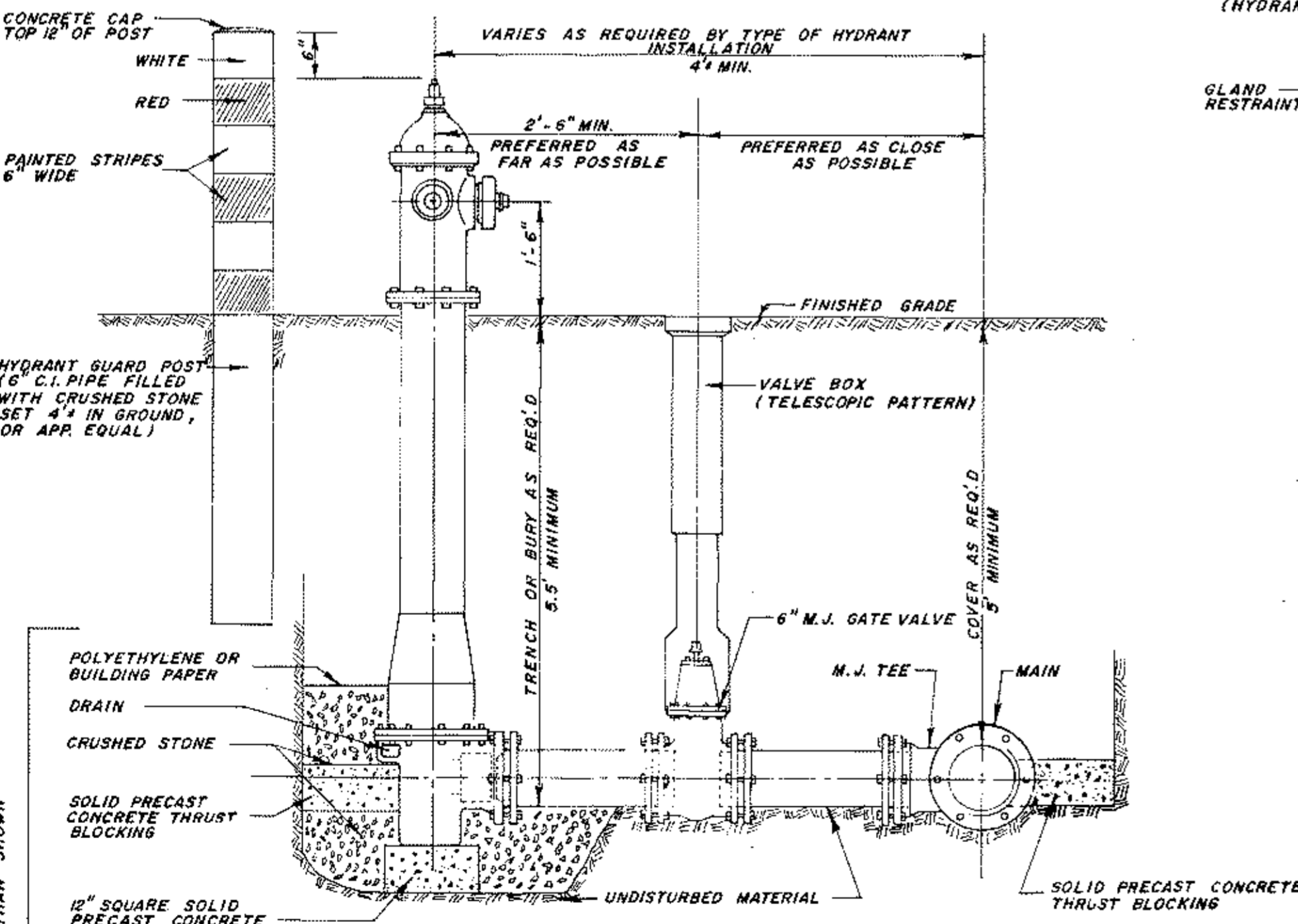


**MECHANICAL JOINT (M.J.)**

**TYPICAL JOINT DETAILS**  
NO SCALE

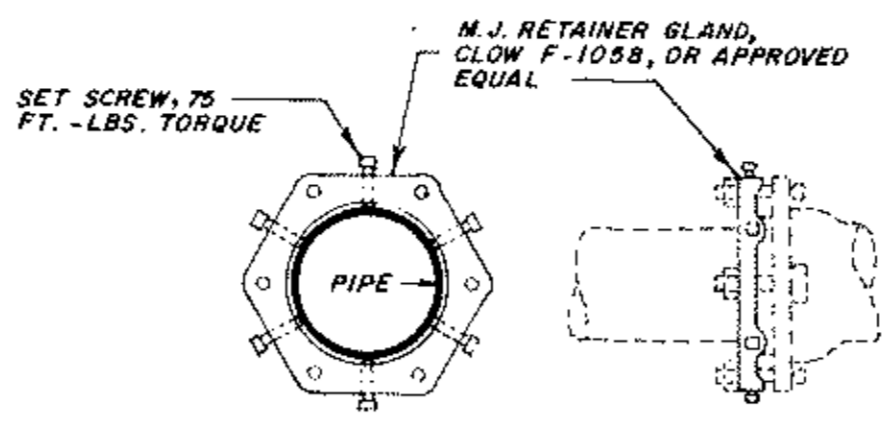


**PLAN**

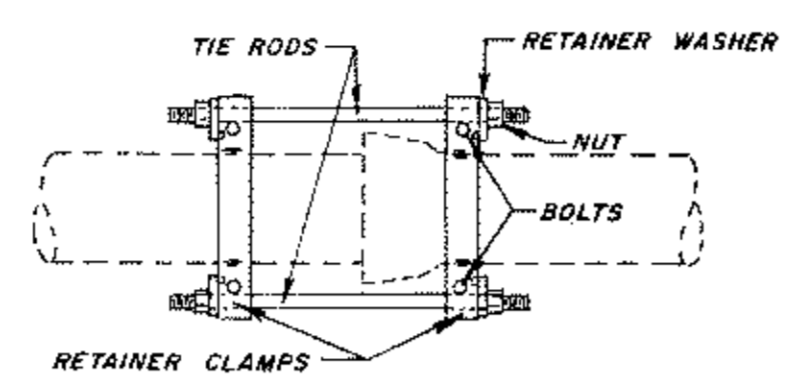


**ELEVATION**

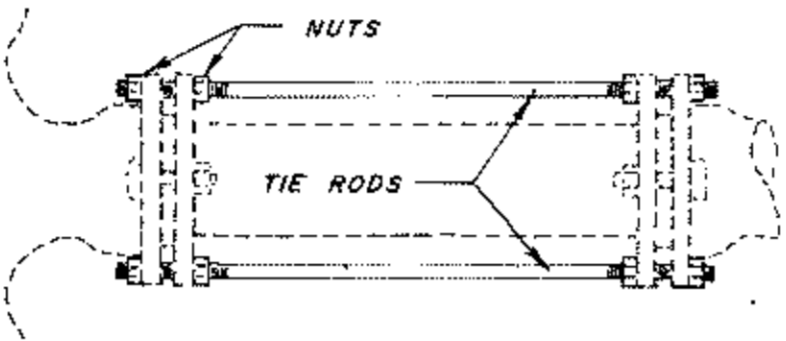
**TYPICAL HYDRANT INSTALLATION**  
NO SCALE



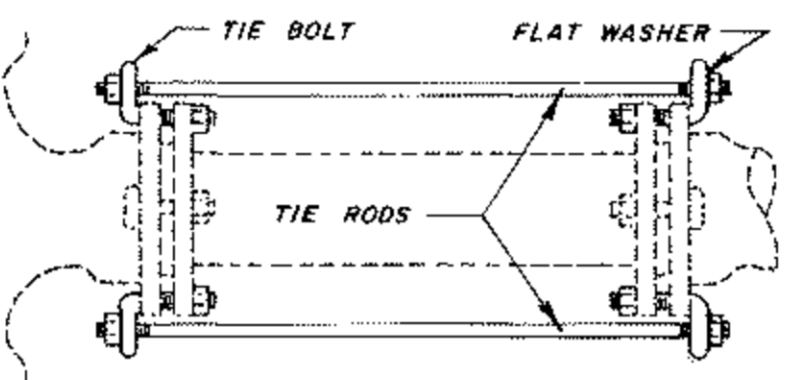
**RETAINER GLAND**



**RETAINER CLAMPS**



**ALTERNATE STYLE**



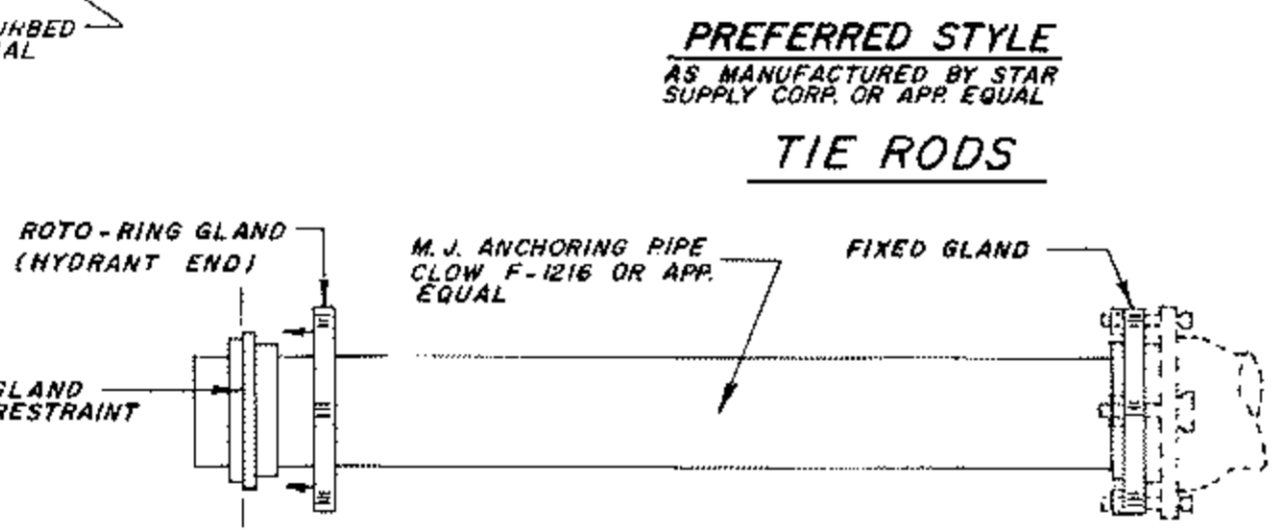
**PREFERRED STYLE**

**TIE RODS**

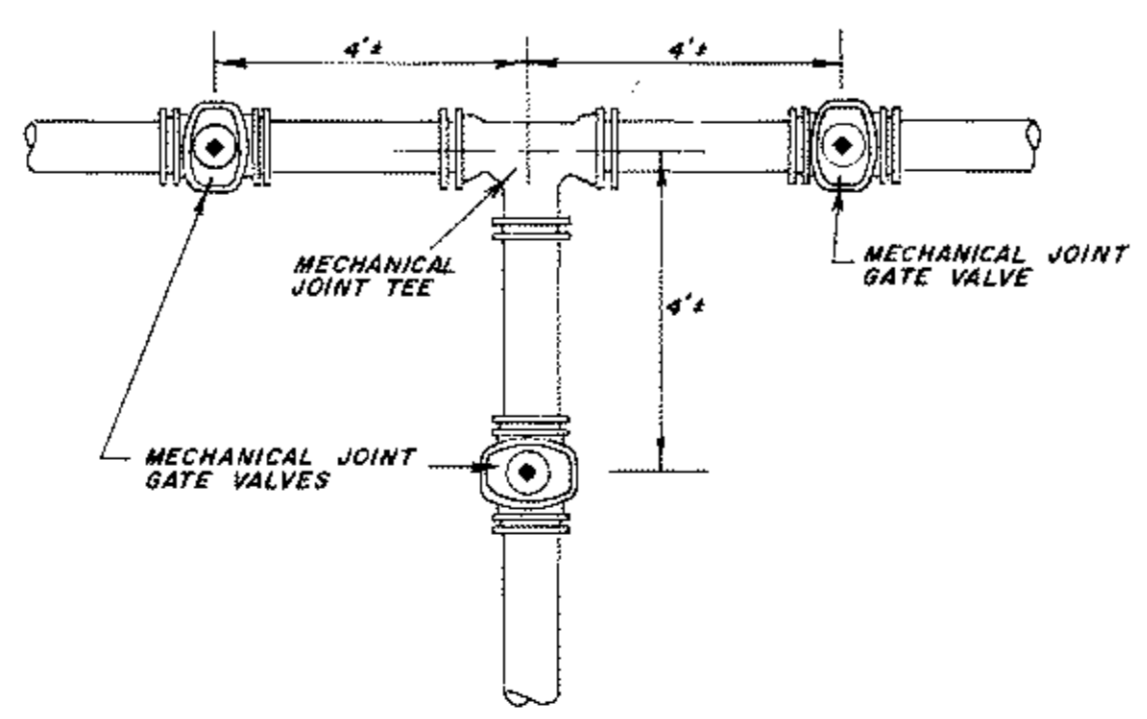
**NUMBER OF TIE RODS REQUIRED**

PIPE SIZE INCHES	MINIMUM NO. OF 3/4" RODS
2	2 <sup>1</sup>
3	2 <sup>1</sup>
4	2
6	2
8	2
10	2
12	2
14	4
16	4
18	6
20	6
24	8
30	14 (8 <sup>2</sup> )
36	18 (12 <sup>2</sup> )

NOTES:  
1. APPLIES TO 5/8" RODS AS WELL.  
2. MINIMUM NO. OF 1" RODS.



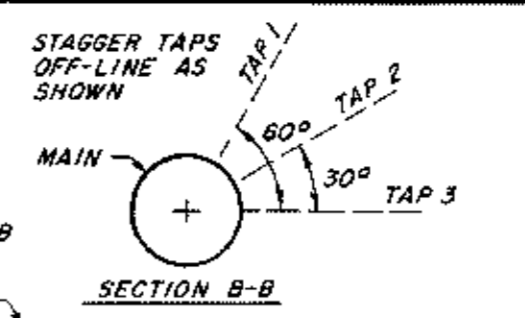
**THRUST RESTRAINT OPTIONS**  
NO SCALE



**TYPICAL JUNCTION LAYOUT**  
NO SCALE

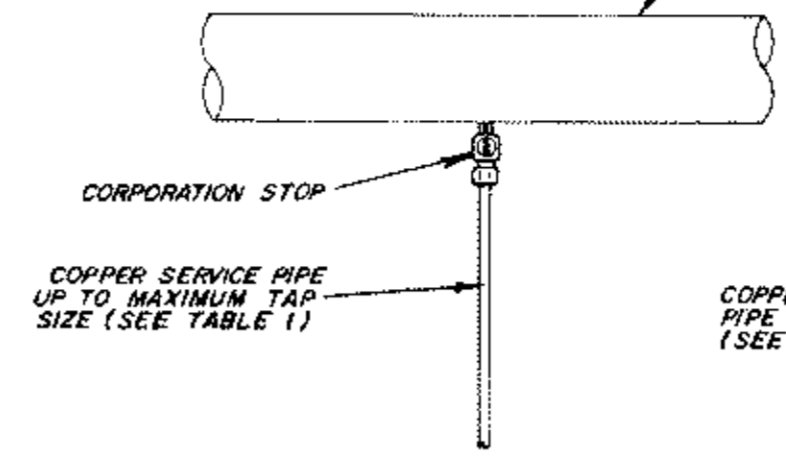
**TABLE 1 - MAXIMUM TAP SIZE**

MAIN SIZE - INCHES	3	4	6	8	10	12 & LARGER
MAX TAP SIZE - INCHES	1/2	3/4	1	1-1/4	1-1/2	2

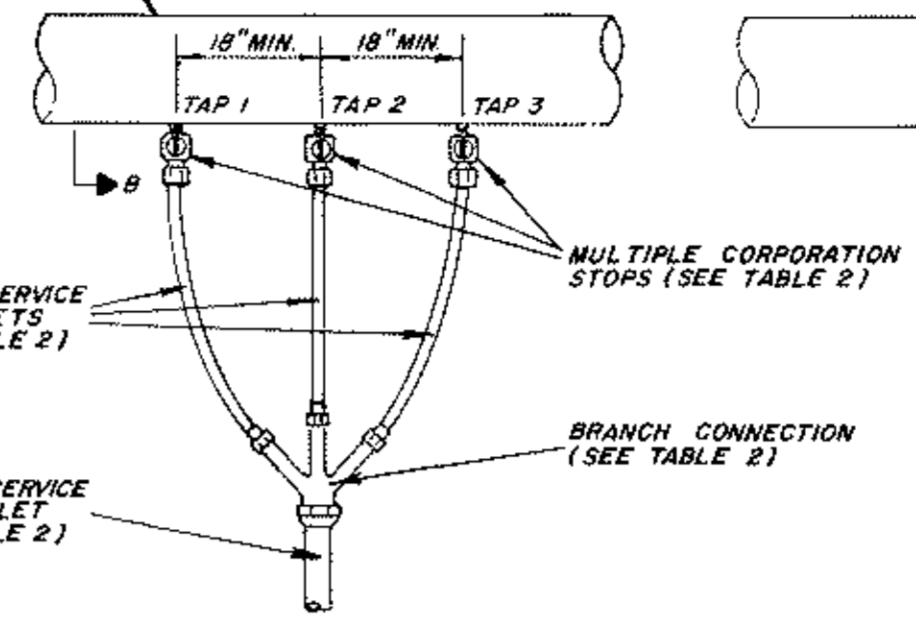


**TABLE 2 - MINIMUM NO. OF BRANCH INLETS**

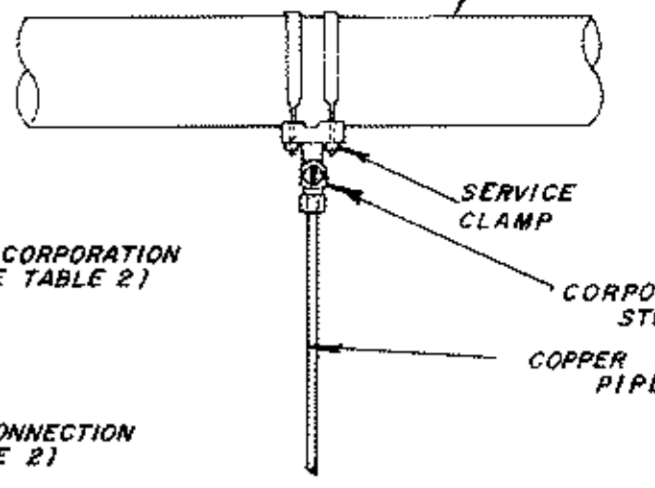
TAP SIZE	OUTLET SIZE - INCHES			
	1	1-1/4	1-1/2	2
3/4	2	3	4	8
1	1	2	3	4



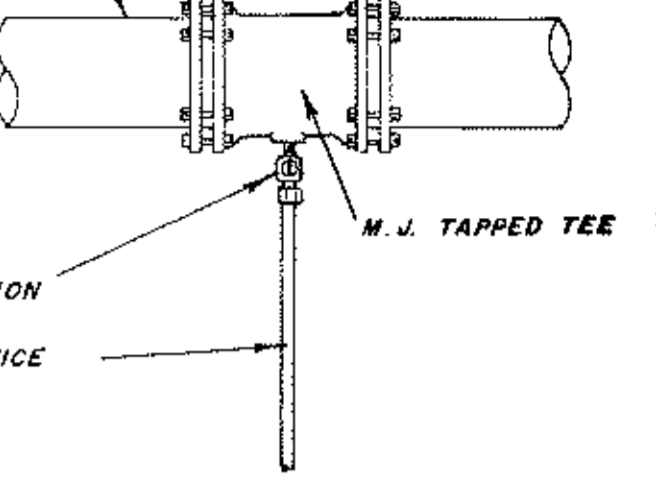
**SINGLE TAP**



**MULTIPLE TAPS**

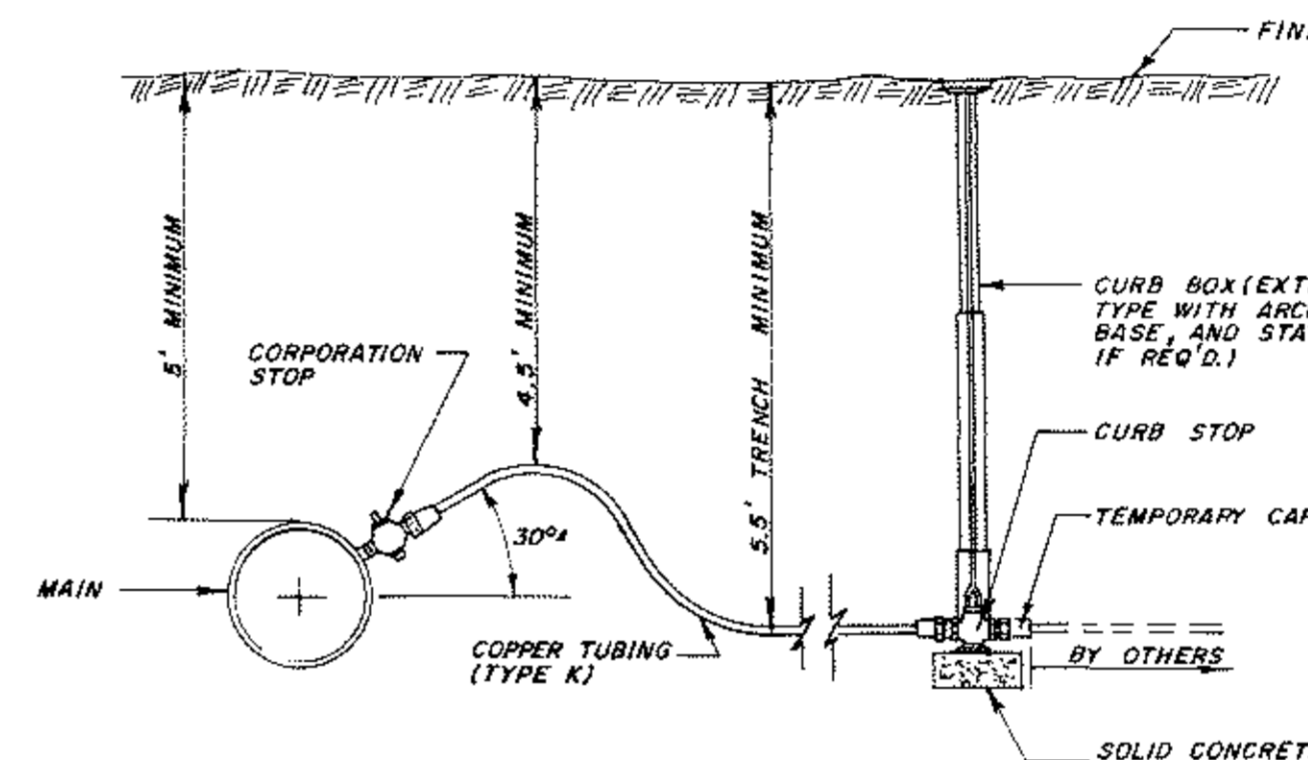


**SERVICE CLAMP**

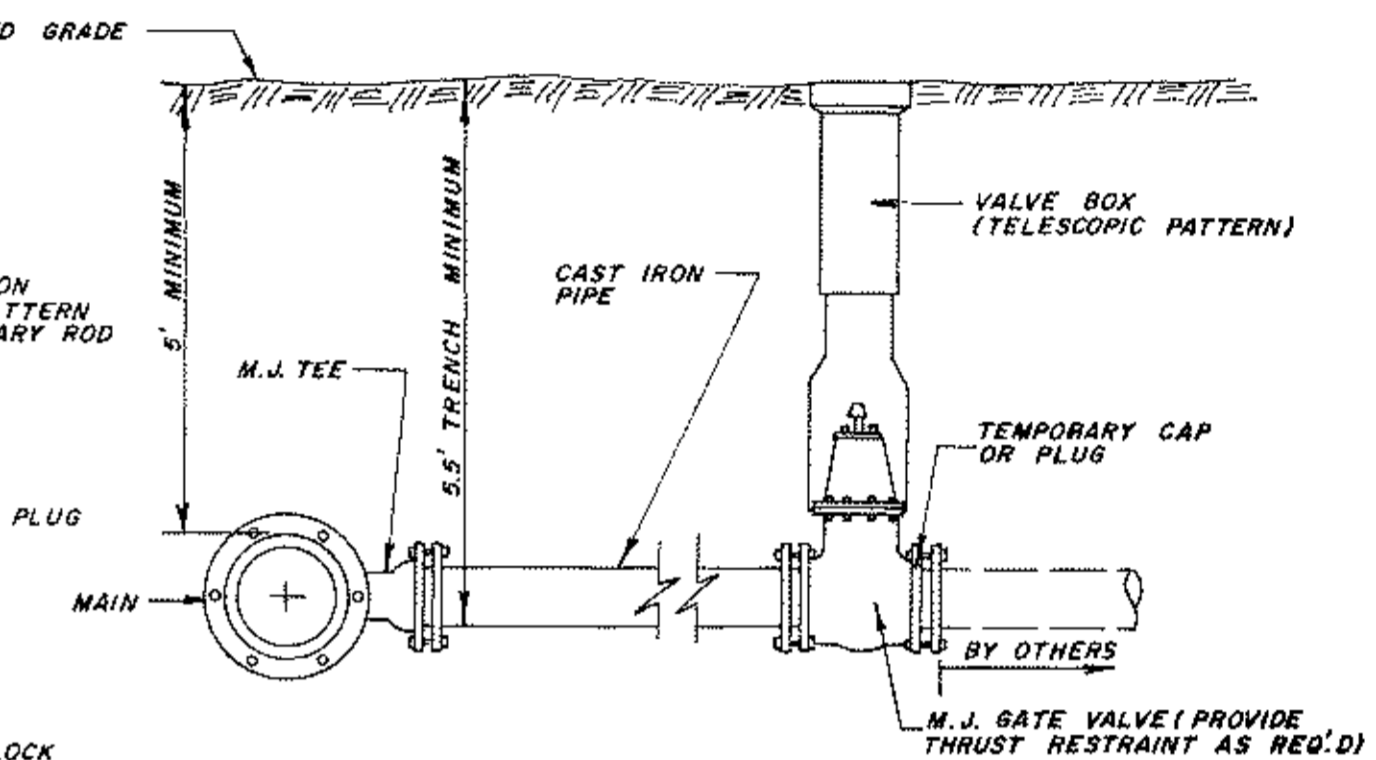


**TAPPED TEE**

**TYPICAL COPPER SERVICE PIPE CONNECTIONS**  
NO SCALE

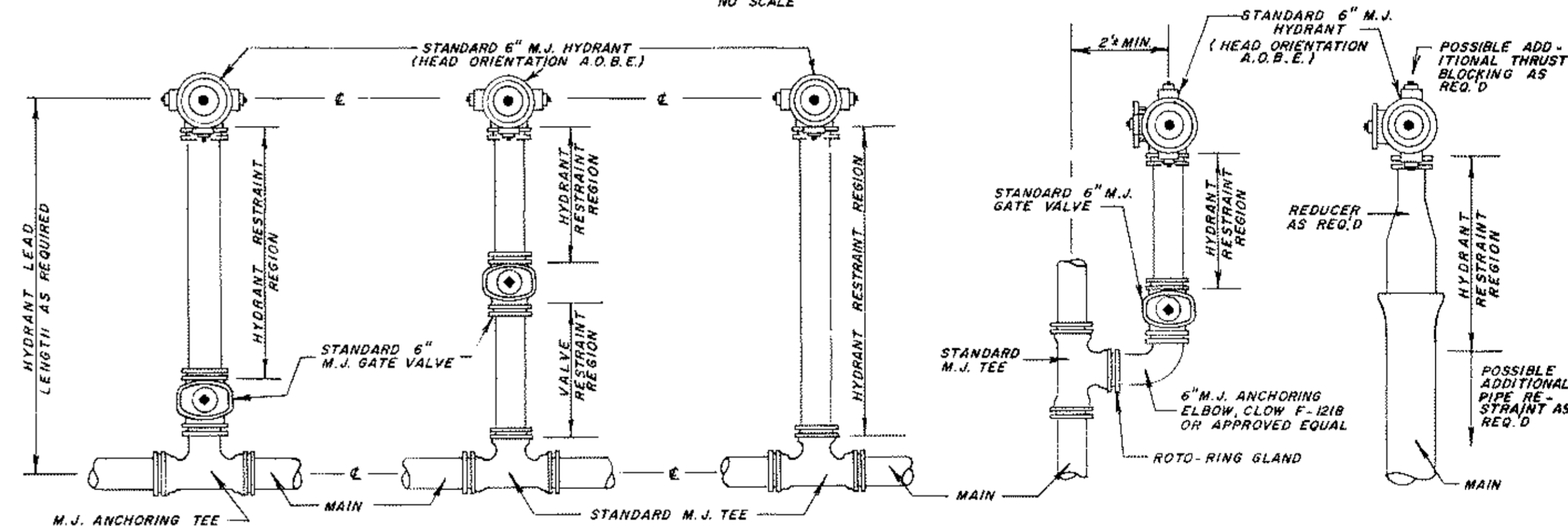


**COPPER SERVICE PIPE**  
FOR SERVICES 2" DIAMETER OR LESS



**CAST IRON SERVICE PIPE**  
FOR SERVICES LARGER THAN 2" DIAMETER

**TYPICAL SERVICE CONNECTION DETAILS**  
NO SCALE



**TYPES OF HYDRANT INSTALLATIONS**  
NO SCALE



DATE	REVISIONS	BY
1-14-72	ORIGINAL	T.P.B.
1-31-72	MULTIPLE TAP POSITIONING REVISED	T.P.B.

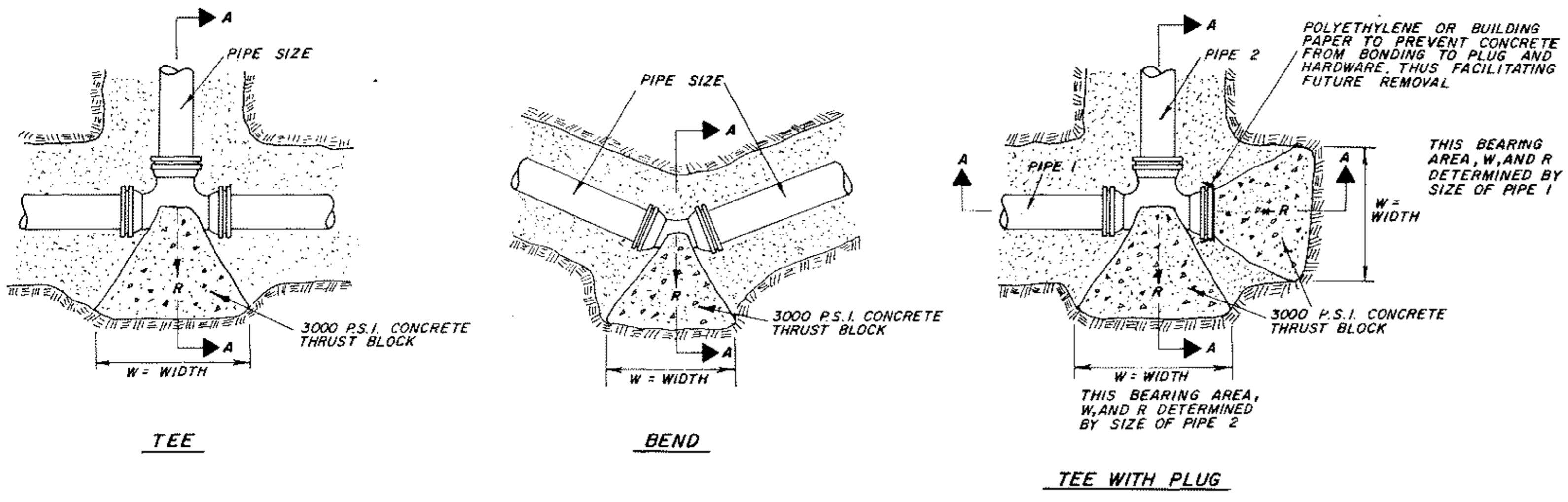
**STANDARD DETAILS**  
CAST OR DUCTILE IRON WATER DISTRIBUTION SYSTEMS

**WATER SYSTEM REPLACEMENT**  
**RENSSELAERVILLE WATER DISTRICT NO. 1**

TOWN OF RENSSELAERVILLE ALBANY COUNTY, N.Y.  
SCALE: AS NOTED DATE: MAY 2, 1980

**CT MALE ASSOCIATES, P.C.**  
PROFESSIONAL ENGINEERS & SURVEYORS  
3000 TROY ROAD, SCHENECTADY, NEW YORK

APPROVED BY K. WAYNE BUNN LIC NO. PE. 49027 NO. 80-85  
DRAWN BY D.B.S. CHECKED BY K.W.B.  
PROJECT NO. 01-17-0035 SHEET NO. 8 OF 10



### REQUIRED BEARING AREAS & DIMENSIONS FOR CONCRETE THRUST BLOCKS

PIPE SIZE INCHES	TEE (See Note 1)		90° (1/4) BEND		45° (1/8) BEND		22-1/2° (1/16) BEND		11-1/4° (1/32) BEND	
	AREA Sq. Ft.	Dimensions D' x W'	AREA Sq. Ft.	Dimensions D' x W'	AREA Sq. Ft.	Dimensions D' x W'	AREA Sq. Ft.	Dimensions D' x W'	AREA Sq. Ft.	Dimensions D' x W'
2	0.4	0.5 x 1.0	0.5	0.5 x 1.0	0.3	0.5 x 1.0	0.1	0.5 x 1.0	0.1	0.5 x 1.0
3	0.8	1.0 x 1.0	1.1	1.0 x 1.5	0.6	0.5 x 1.5	0.3	0.5 x 1.0	0.2	0.5 x 1.0
4	1.4	1.0 x 1.5	2.0	1.0 x 2.0	1.1	1.0 x 1.5	0.6	0.5 x 1.5	0.3	0.5 x 1.0
6	3.2	1.5 x 2.5	4.5	2.0 x 2.5	2.4	1.5 x 2.0	1.2	1.0 x 1.5	0.6	0.5 x 1.5
8	5.7	2.0 x 3.0	8.0	2.0 x 4.0	4.3	2.0 x 2.5	2.2	1.5 x 1.5	1.1	1.0 x 1.5
10	8.8	2.5 x 3.5	12.5	3.0 x 4.5	6.8	2.0 x 3.5	3.4	1.5 x 2.5	1.7	1.0 x 2.0
12	12.7	3.5 x 3.5	18.0	4.0 x 4.5	9.7	2.5 x 4.0	5.0	2.0 x 2.5	2.5	1.5 x 2.0
14	17.3	3.5 x 5.0	24.5	4.5 x 5.5	13.3	3.5 x 4.0	6.8	2.0 x 3.5	3.4	1.5 x 2.5
16	22.6	4.5 x 5.0	32.0	5.0 x 6.5	17.3	3.5 x 4.5	8.8	2.5 x 3.5	4.4	2.0 x 2.5
18	28.6	5.0 x 6.0	40.5	5.5 x 7.0	21.9	4.0 x 5.5	11.2	3.0 x 4.0	5.6	2.0 x 3.0
20	35.3	5.5 x 6.5	50.0	6.5 x 8.0	27.0	4.5 x 6.0	13.8	3.5 x 4.0	6.9	2.0 x 3.5
24	50.9	7.0 x 7.5	72.0	7.5 x 10.0	38.9	5.0 x 8.0	19.8	4.0 x 5.0	10.0	2.5 x 4.0
30	79.5	8.0 x 10.0	112.4	8.5 x 13.5	60.8	6.0 x 10.5	31.0	4.5 x 7.0	15.6	3.5 x 4.5
36	114.5	10.0 x 11.5	161.9	10.5 x 15.5	87.6	8.0 x 11.0	44.7	5.0 x 9.0	22.4	4.5 x 5.0

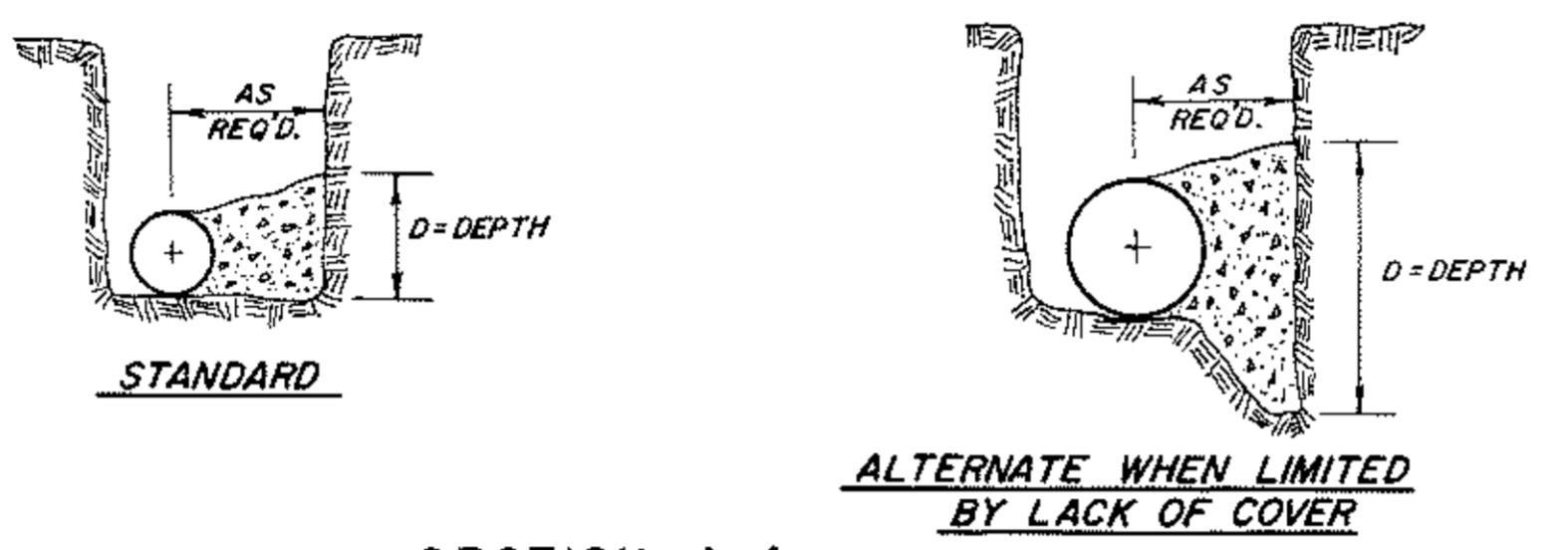
### THRUST REACTIONS-R PER 100 P.S.I. INTERNAL PRESSURE

PIPE SIZE INCHES	TEE (See Note 1) T POUNDS	90° (1/4) BEND (1.414 x T)	45° (1/8) BEND (0.765 x T)	22-1/2° (1/16) BEND (0.390 x T)	11-1/4° (1/32) BEND (0.186 x T)
2	320	450	240	120	60
3	710	1000	540	280	140
4	1260	1780	960	490	250
6	2830	4000	2160	1100	550
8	5030	7110	3850	1960	990
10	7850	11,110	6010	3060	1540
12	11,310	16,000	8650	4410	2220
14	15,390	21,770	11,780	6000	3020
16	20,110	28,430	15,380	7840	3940
18	25,450	35,980	19,470	9920	4990
20	31,420	44,420	24,030	12,250	6160
24	45,240	63,970	34,610	17,640	8870
30	70,690	99,950	54,080	27,570	13,850
36	101,790	143,930	77,870	39,700	19,950

**NOTES:**

- FOR REQUIRED BEARING AREA AND DIMENSIONS D & W SEE TABLE AT RIGHT. VALUES OF D & W OTHER THAN THOSE SHOWN IN THE TABLE MAY BE USED PROVIDED THEY YIELD A BEARING AREA EQUAL TO OR LARGER THAN THAT REQUIRED.
- CONCRETE NOT TO OVERLAP ANY JOINT.
- CONCRETE TO BE PLACED SO AS NOT TO INTERFERE WITH REMOVING OR INSTALLING ANY OF THE JOINTING HARDWARE.
- APPROXIMATE VOLUME OF CONCRETE THRUST BLOCK:  $V = \frac{WD(X + I.D.) - I.D.^2}{61}$

WHERE:  
 V = VOLUME IN CUBIC YARDS  
 W = WIDTH OF BLOCK IN FEET  
 D = DEPTH OF BLOCK IN FEET  
 I.D. = INSIDE DIAMETER OF PIPE IN FEET  
 X = "AS REQ'D." DISTANCE IN FEET



**NOTES:**

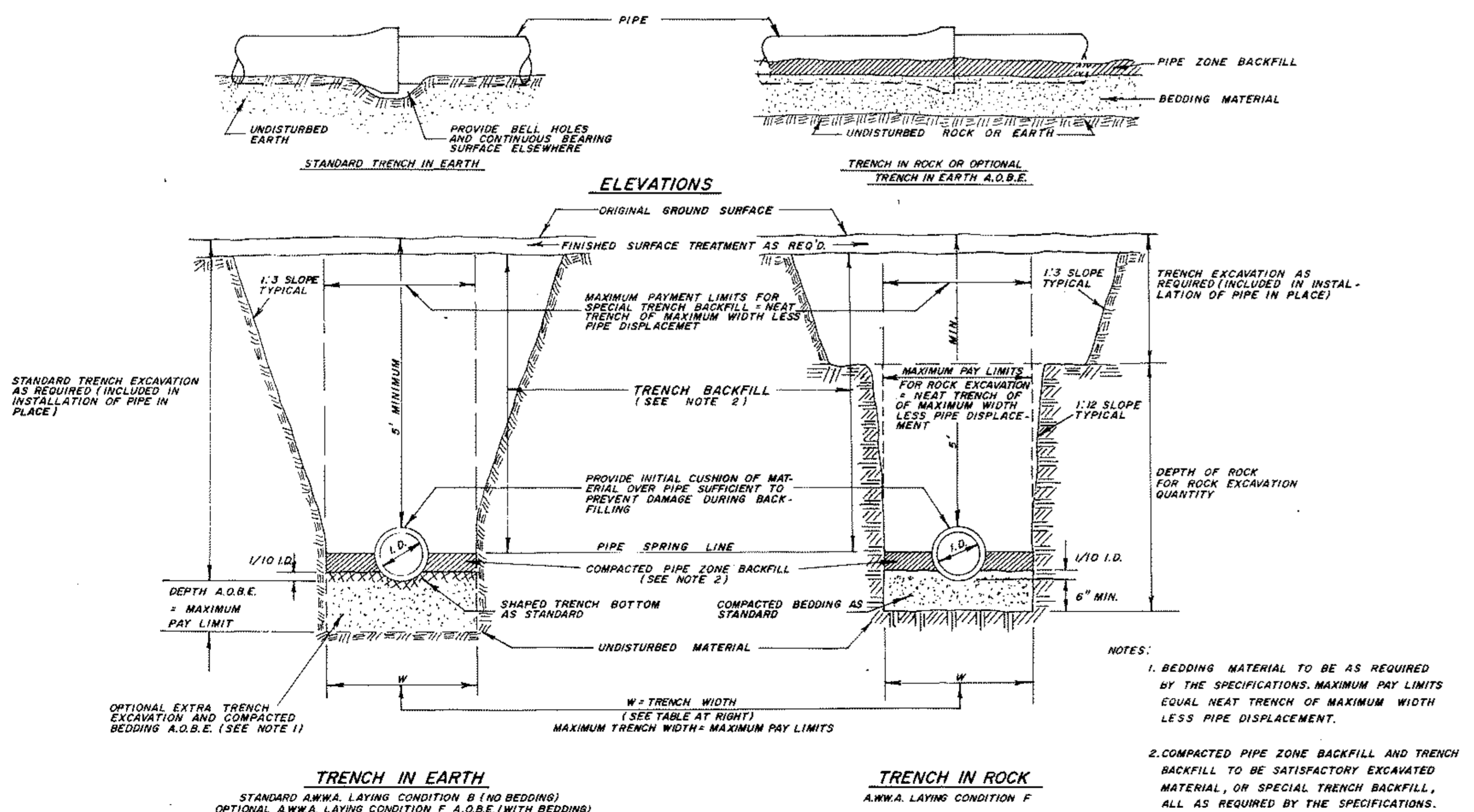
- VALUES FOR TEE APPLY TO TEES, END PLUGS, CAPS, AND TAPPING SLEEVES.
- REQUIRED BEARING AREAS ARE DUE TO THRUSTS CAUSED BY 150 P.S.I. WORKING PRESSURE PLUS 50% (75 P.S.I.) SURGE ALLOWANCE RESULTING IN 225 P.S.I. TOTAL INTERNAL PRESSURE.
- REQUIRED BEARING AREAS ARE BASED ON ALLOWABLE SOIL BEARING CAPACITY OF 2000 POUNDS PER SQUARE FOOT FOR SAND. DUE TO OTHER SOIL CONDITIONS ENCOUNTERED, BEARING AREAS MAY BE MODIFIED BY THE ENGINEER BY MULTIPLYING THE AREA GIVEN IN THE TABLE FOR THE APPROPRIATE PIPE SIZE AND FITTING BY THE CORRECTION FACTORS LISTED TO THE RIGHT.

SOIL	ALLOWABLE SOIL PRESSURE (LBS./SQ. FT.)	CORRECTION FACTOR
SOFT CLAY	1000	2.00
SAND	2000	1.00
SAND & GRAVEL	3000	0.67
SAND & GRAVEL CEMENTED W/CLAY	4000	0.50
HARD SHALE	10,000	0.20

4. IN MUCK, PEAT, OR RECENTLY PLACED FILL ALL THRUSTS SHALL BE RESISTED BY PILES OR TIE RODS TO SOLID FOUNDATIONS, OR BY REMOVAL OF SUCH UNSTABLE MATERIAL AND REPLACEMENT WITH BALLAST OF SUFFICIENT STABILITY TO RESIST THE THRUSTS, ALL AS REQUIRED BY THE ENGINEER.

### TYPICAL CONCRETE THRUST BLOCK DETAILS

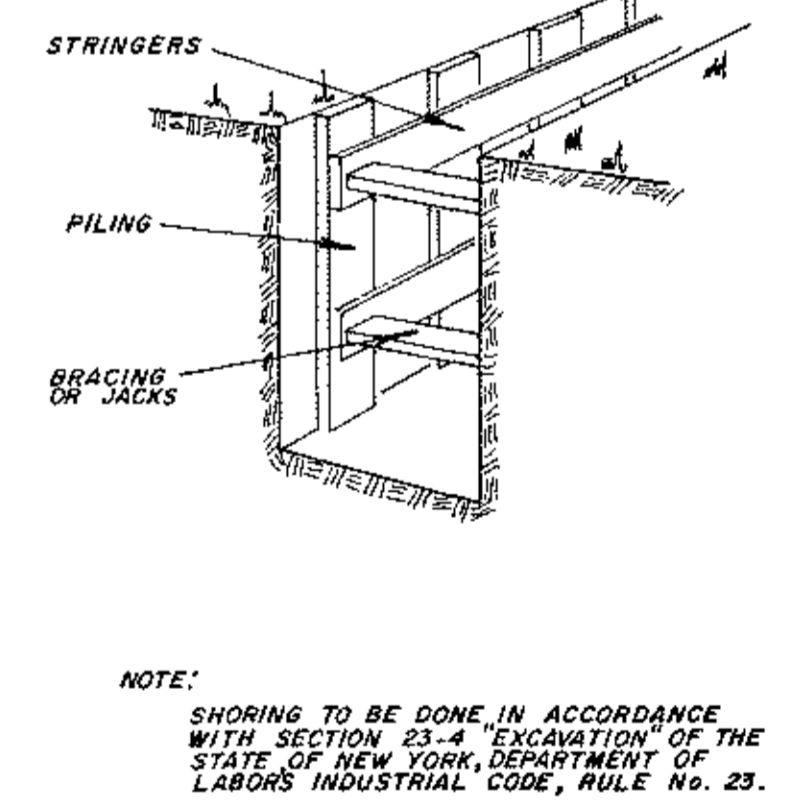
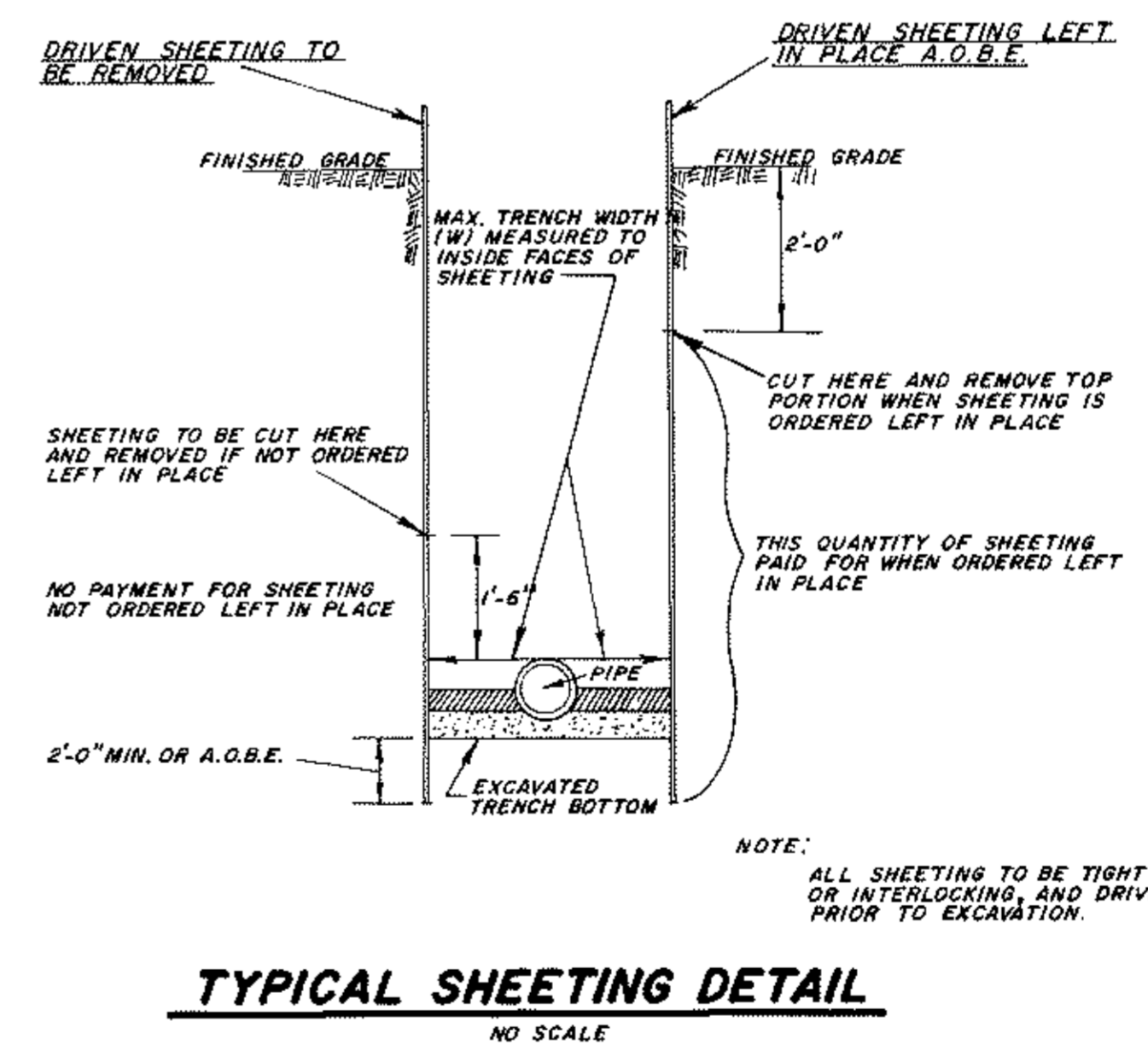
NO SCALE



### TYPICAL TRENCH DETAILS

NO SCALE

PIPE SIZE - I.D. (INCHES)	MIN. SUGGESTED TRENCH WIDTH FOR AMPLE WORKING SPACE (I.D. PLUS 15 INCHES)	MAX. TRENCH WIDTH ALLOWED - MAX. PAY LIMITS (I.D. PLUS 24")
2	17	26
3	18	27
4	19	28
6	21	30
8	23	32
10	25	34
12	27	36
14	29	38
16	31	40
18	33	42
20	35	44
24	39	48
30	45	54
36	51	60



DATE: 1-14-78  
 REVISIONS: ORIGINAL  
 BY: T.P.B.  
 DRAWN BY: D.B.S.  
 CHECKED BY: K.W.B.

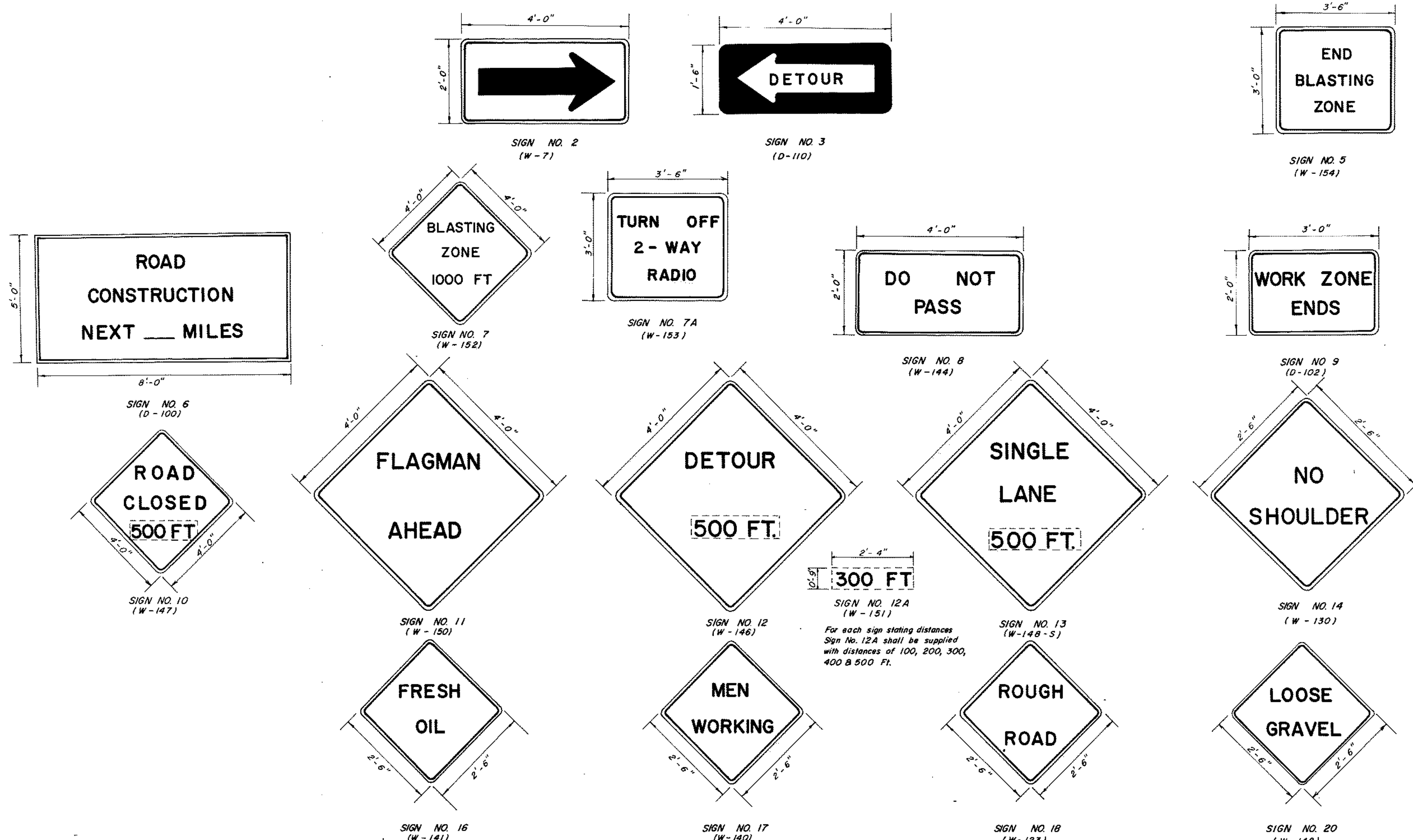
**STANDARD TRENCH DETAILS**  
 CAST OR DUCTILE IRON WATER DISTRIBUTION SYSTEMS

**WATER SYSTEM REPLACEMENT**  
**RENSSELAERVILLE WATER DISTRICT NO. 1**

TOWN OF RENNSAELVILLE ALBANY COUNTY, N.Y.  
 SCALES: AS NOTED DATE: MAY 2, 1980

**CT MALE ASSOCIATES, P.C.**  
 PROFESSIONAL ENGINEERS & SURVEYORS  
 3000 TROY ROAD, SCHENECTADY, NEW YORK

APPROVED BY: K. WAYNE BUNN LIC NO. PE. 49027 NO. 80-85  
 PROJECT NO. 01-17-0035 SHEET NO. 9 OF 10



**GENERAL NOTES**

- General** : ALL SIGNS SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER.
- Sign Support** : THE CONTRACTOR SHALL SUPPLY ADEQUATE SUPPORTS SO THAT THE SIGNS ARE IN PROPER POSITION AND ALIGNMENT AS SHOWN ON THE CONTRACT PLANS OR AS ORDERED BY THE ENGINEER. ALL SUPPORTS SHALL BE PAINTED WITH TWO (2) COATS OF WHITE PAINT.
- Sign Panels** : THE SIGN PANELS MAY BE MADE OF ALUMINUM, STEEL, OR PLYWOOD. THE BACKS OF ALL SIGN PANELS SHALL RECEIVE TWO (2) COATS OF WHITE PAINT.
- Sign Face** : **Color** - THE COLOR OF THE BACKGROUND AND THE LEGEND OF ALL SIGNS SHALL BE AS DESIGNATED IN THE CONTRACT PLANS AND SPECIFICATIONS, OR AS SPECIFIED BY THE ENGINEER. THE MARGIN SHALL BE OF THE SAME COLOR AS SPECIFIED FOR THE BACKGROUND. THE BORDER SHALL BE OF THE SAME COLOR AS THE LEGEND.  
**Shape** - THE SHAPE OF ALL SIGNS SHALL BE AS INDICATED IN THE CONTRACT PLANS AND SPECIFICATIONS. CORNERS OF SIGNS SHALL HAVE GENERALLY ROUNDED CORNERS.  
**ReflectORIZATION** - ALL STANDARD SIGNS SHALL BE REFLECTORIZED. REFLECTION OF BLACK ON WHITE AND BLACK ON YELLOW SHALL BE OBTAINED BY USE OF REFLECTING MATERIAL OF THE APPROPRIATE COLOR FOR THE BACKGROUND AND MARGIN. REFLECTORIZATION OF WHITE ON BLACK SIGNS SHALL BE OBTAINED BY THE USE OF WHITE OR CLEAR REFLECTING UNITS OR REFLECTING MATERIAL IN THE LEGEND AND BORDER.  
**Lettering and Borders** - SIGN LETTERING SHALL BE ESSENTIALLY IN ACCORDANCE WITH THE STANDARD ALPHABETS FOR HIGHWAY SIGNS AS PUBLISHED BY THE U.S. BUREAU OF PUBLIC ROADS. SIZES OF LETTERS SHALL BE AS SHOWN IN THE TABULATION ON THE CONTRACT PLANS. THE BORDER AND MARGIN WIDTHS SHALL BE ESSENTIALLY AS SHOWN IN THE TABULATION IN THE CONTRACT PLANS.
- Sign Location** : ALL SIGNS SHALL BE LOCATED AS SHOWN ON THE CONTRACT PLANS OR AS SPECIFIED BY THE ENGINEER. SIGNS SHALL BE GENERALLY LOCATED ON THE RIGHT SIDE OF THE HIGHWAY FACING APPROACHING TRAFFIC WITH NEAR EDGE OF THE SIGN BETWEEN 6 AND 12 FEET FROM NEAREST EDGE OF THE TRAVELED ROADWAY OR AT LEAST 2 FEET FROM THE FACE OF THE VERTICAL CURB, UNLESS OTHERWISE ORDERED BY THE ENGINEER. SIGNS SHOULD GENERALLY BE PLACED AT RIGHT ANGLES TO THE TRAFFIC THEY SERVE. ROADSIDE SIGNS SHOULD BE MOUNTED SO THAT THE BOTTOM OF THE SIGN IS APPROXIMATELY 5 FEET ABOVE THE EDGE OF PAVEMENT. SIGNS MOUNTED ON BARRICADES OR TEMPORARY SIGNS IN THE ROADWAY MAY BE AT LOWER HEIGHTS AS DICTATED BY THE CIRCUMSTANCES. ALL SIGNS SHALL BE LOCATED SO AS TO BE PLAINLY VISIBLE TO THE TRAFFIC WHICH THEY SERVE.
- Maintenance** : THE CONTRACTOR SHALL KEEP THE SIGNS CLEARED AT ALL TIMES. ALL SIGNS SHALL BE THE PROPERTY OF THE CONTRACTOR AND SHALL BE MAINTAINED IN GOOD CONDITION FOR THE DURATION OF THE CONTRACT AND REMOVED FROM THE WORK SITE WHEN THE CONTRACT IS COMPLETED AND THE WORK ACCEPTED.
- Compliance** : ALL SIGNS FOR NEW YORK STATE HIGHWAYS ARE TO BE CONSTRUCTED AND PLACED IN ACCORDANCE WITH THE NYS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.

SIGN NO.	COLOR	SIZE	MARGIN	BORDER	LETTER SIZE						MIN. NO. SIGNS REQ'D THIS CONTRACT	SIGN NO.
					LINE 1	LINE 2	LINE 3	LINE 4	LINE 5	LINE 6		
2	BLACK ON ORANGE	48" x 24"	1/2"	3/4"							AS REQ'D BY NYS DOT'S MUTCD	2
3	BLACK ON ORANGE	48" x 18"	NONE	VARIABLE	6"							3
5	BLACK ON ORANGE	42" x 36"	5/8"	7/8"	7"	7"	7"					5
6	BLACK ON ORANGE	96" x 60"	3/4"	1"	9"	9"	9"					6
7 (7A)	BLACK ON ORANGE	AS SHOWN	3/4" (5/8")	1 1/4" (7/8")	7" (7")	7" (7")	7" (7")					7
8	BLACK ON ORANGE	48" x 24"	5/8"	3/4"	8"	8"	8"					8
9	BLACK ON ORANGE	36" x 24"	5/8"	7/8"	5"	5"						9
10	BLACK ON ORANGE	48" x 48"	3/4"	1 1/4"	7"	7"						10
11	BLACK ON ORANGE	48" x 48"	3/4"	1 1/4"	7"	7"						11
12	BLACK ON ORANGE	48" x 48"	3/4"	1 1/4"	8"	7"						12
13	BLACK ON ORANGE	48" x 48"	3/4"	1 1/4"	7"	7"	6"					13
14	BLACK ON ORANGE	30" x 30"	1/2"	3/4"	5"	5"						14
16	BLACK ON ORANGE	30" x 30"	1/2"	3/4"	6"	6"						16
17	BLACK ON ORANGE	30" x 30"	1/2"	3/4"	5"	5"						17
18	BLACK ON ORANGE	30" x 30"	1/2"	3/4"	6"	6"						18
20	BLACK ON ORANGE	30" x 30"	1/2"	3/4"	5"	5"						20

For each sign stating distances Sign No. 12A shall be supplied with distances of 100, 200, 300, 400 & 500 Ft.



DATE	REVISIONS	BY
6-76	UPDATED TO NYS MUTCD, JULY 1, 1974 ed.	DBM

**STANDARD SIGN DETAILS**

**WATER SYSTEM REPLACEMENT  
RENSSELAERVILLE WATER DISTRICT NO. 1**

TOWN OF RENSSELAERVILLE      ALBANY COUNTY, N.Y.

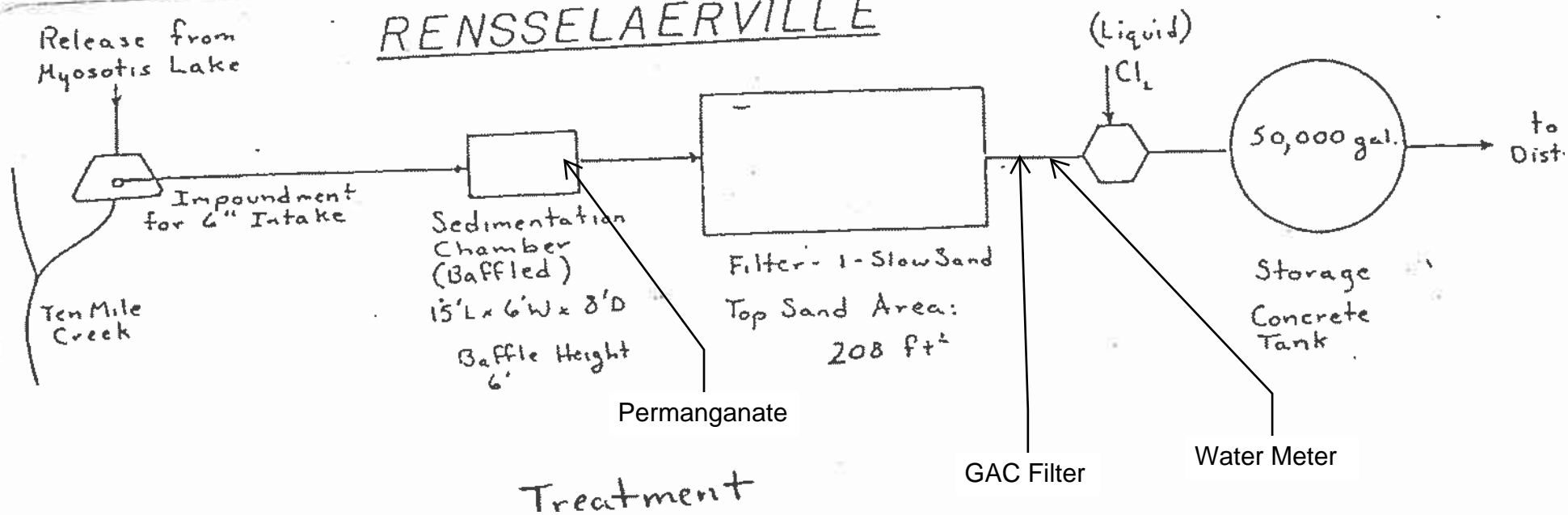
SCALE: NONE      DATE: MAY 2, 1980

**GT MALE ASSOCIATES, P.C.**  
PROFESSIONAL ENGINEERS & SURVEYORS  
3000 TROY ROAD, SCHEENECTADY, NEW YORK

PREPARED BY K. WAYNE BUNN      LIC. NO. PE. 49027      NO. 80-85

Project No. 01-17-0035      Sheet 10 of 10

# RENSSELAERVILLE



Rensselaerville, NY

---

# Rice Road Tank

50,000 Gallon Inground Concrete Tank

4/3/2024

Prepared By:



Atlantic Underwater Services Inc.  
2538 State Route 8  
Lake Pleasant, NY 12108  
(757)750-9081

ROV And Drained AWWA Potable Water Storage Tank,  
NFPA Fire Water Storage Tank, & Pipeline Inspections

# Declaration

**This report was composed from the visual observations made during an inspection of this water storage facility. Portions of this report may also contain material or other information obtained from conversations with the utility personnel, the tank information plate, drawings, reports, etc. The information contained herein is believed to be as true and accurate as could be obtained from these observations and the information and material supplied to us. No other assurance or warranty is expressed or implied. We assume no responsibility for any errors or omissions in this report.**

**The time frames stated in the recommendations are estimates based on our years of experience with other storage facilities and paint installations, and discussions with corrosion engineers, paint manufacturer's representatives, tank constructors, painting contractors, etc. Although these estimates can be considered to be fairly reliable, many different factors affect the condition of the water storage facility over time and we can not be held responsible for the accuracy of these estimates. Since the condition of the storage facility will change over time, the accuracy of the condition of the storage facility described in this report will decrease according to the amount of time that has elapsed since the date of the inspection. Should three (3) or more years have elapsed since this inspection, this report should be considered to be null and void and the storage facility should be reinspected to determine the current condition.**

**It is to be noted that, although this inspection report is signed by a P.E. since this P.E. is not registered in all states, it is not to be assumed or inferred that he is registered in your state unless this report has been professionally stamped and/or sealed.**

**By:**

**Timothy L. Smith**

**Copyright © 2024 by Atlantic Underwater Services Inc. All rights reserved. This document was delivered in electronic and printed formats and the client(s) or their authorized representatives are authorized to copy, print or transmit copies of this document without modification. Copying, reproducing, or transmitting of this document by other parties, or the modification of any or all portions of this document, including the formatting and material contained herein, or the use of this document or portions thereof for any other inspection, is expressly forbidden without the prior written permission of the author.**

# Tank Information

<b>The height to overflow is about:</b>	<b>10'</b>
<b>The tank height is about:</b>	<b>10'</b>
<b>The diameter or dimensions of this tank is about:</b>	<b>30'</b>
<b>This tank was constructed at the present location in:</b>	<b>1957 Approx.</b>
<b>This tank has how many interior columns:</b>	<b>None</b>
<b>If this tank interior has been coated, recoated, or repaired, the latest this was done was:</b>	<b>NO</b>
<b>Interior ladder (if existing) meets 16" width requirement:</b>	<b>NO</b>
<b>This tank was previously inspected:</b>	<b>NO</b>

# Structural Condition

<b>Component</b>	<b>Description</b>	<b>O.K.</b>	<b>Problem</b>	<b>N/A</b>
Air Vent	Not excessively damaged, corroded, or deteriorated:			X
Leaks	No indications of leakage observed:		X	
Interior Ladder	Not excessively bent, dented, twisted, damaged, corroded:		X	
Interior Support Columns	Surfaces not excessively corroded or deteriorated:			X

# Structural Condition (Cont.)

Component	Description	Yes	No	N/A
Concrete Floor:	Excessive or deep cracking:		X	
	Excessive or deep spalling:		X	
	Exposed reinforcement steel:		X	
	Pipe penetrations are not adequately sealed and leakage or other problems were observed:		X	
	Problems at sumps which are ____' in diameter or ____' by ____' and are _____ deep:			X

Component	Description	Yes	No	N/A
Concrete Walls:	Excessive or deep cracking:		X	
	Excessive or deep spalling:		X	
	Exposed reinforcement steel:		X	
	Hollow sections:		X	
	Protective coating deteriorated:		X	

Component	Description	Yes	No	N/A
Concrete Roof:	Excessive or deep cracking:		X	
	Excessive or deep spalling:		X	
	Exposed reinforcement steel:		X	
	Hollow sections:		X	
	Protective coating deteriorated:			X
	Stains, stalactites, or leaks from exterior water:	X		

# Sanitary Condition

Component	Description	O.K.	Problem	N/A
Perimeter Fence	Has barbed wire on the top, is not damaged or deteriorated, has "No Trespassing" signs:		X	
Gates	Are not damaged and can be opened:			X
Locks	Perimeter gate have locks:			X
Overflow screen, flap, size	Is adequately screened or flap opens and closes and pipe is large enough:			X
Vent Screen Material	Screen is metal, not damaged, not excessively corroded, or missing:			X
Access hatch	Has no excessive corrosion, is not deteriorated or bent, structurally sound:		X	
Access Hatch Lock	Upper access hatch adequately locked:	X		
Evidence of Foreign Matter	No debris laying on tank bottom:	X		
Vandalism	No graffiti, litter, trash, or damage:	X		
Silt Stop	Silt stop is not missing or displaced			X
Water Visibility	Visibility in water is at least 10':	X		
Floating Surface Debris	No debris floating on water surface:	X		

## Sediment:

Average Sediment Depth:	Less than ½"	Less than 1":	1" to 5"	5" to 10" or more
	X			

# Recommendations

## General Recommendations

Item	Description	Yes	No	N/A
1.	Reinspect tank interior in 5 years:	X		
2.	Recoat or repair the tank interior:		X	
3.	Replace or repair existing interior ladder:	X		
4.	Modify or add safety equipment to interior ladder(s):			X
5.	Repair or replace roof vents:			X
6.	Install, repair, or modify access control fence:	X		

# Recommendations (Cont.)

## Recommendations Unique and Specific To This Tank

Item	Description
1.	The items listed as YES in the Structural Section, PROBLEM in the STRUCTURAL and SANITARY Sections, and listed as YES in the GENERAL RECOMMENDATIONS should be installed, modified, or repaired as indicated.
2.	The interior ladder rungs are made from Rebar, and several are deteriorated and unsafe to use. When the tank is overhauled in the future the ladder should be replaced with a bolted-on ladder.
3.	The tank roof allows some water into the tank. The exterior roof should be cleaned and coated with a weather resistant coating such as Raven Linings Quad epoxy or CIM material, which can easily be applied once the roof is cleaned of dirt and loose material.
4.	For the liability of the town a perimeter fence should be install around the water tank. Posted signs should be attached at 30' intervals.
5.	The access hatch is a flat hatch that doesn't have a flange that allows it to seal out rainwater and other contaminants. A new hatch with a 2" flange and seal should be installed when funds are available.
6.	The only area in the tank with sediment is at the base of the ladder and access hatch. The remaining floor is extremely clean and free from sediment and debris.
7.	The interior ceiling is showing signs of leaking with white stalactites hanging from the ceiling.

Please contact us if you have any questions about our inspection or the recommendations or conclusions of this inspection report.

# Photo Identification

**Note:** You also receive a Flash Drive with digital copies of all the photos taken during the inspection, an electronic copy of this complete report including photos as a word document, and the interior video as a Windows Media File (.wmv) that you can copy to and play on your computer.

**NOTE: THERE IS AN EXTENSIVE AMOUNT OF INTERIOR AND EXTERIOR PHOTOS THAT WERE TAKEN AS PART OF THIS INSPECTION WHICH ARE ON THE PHOTO FLASH DRIVE THAT YOU RECEIVE ALONG WITH THIS INSPECTION REPORT. THE PHOTOS PRINTED IN THIS REPORT ARE JUST A REPRESENTATION AND YOU SHOULD REVIEW THE ENTIRE PHOTO COLLECTION ON THE DRIVE.**

<b>PAGE NUMBER</b>	<b>DESCRIPTION</b>
<b>9-11</b>	<b>Exterior Photos</b>
<b>12-13</b>	<b>Interior Ladder</b>
<b>14-15</b>	<b>Sidewalls</b>
<b>16</b>	<b>Water outlet pipe</b>
<b>17-19</b>	<b>Bottom</b>
<b>20-22</b>	<b>Interior Ceiling</b>

# Pictures

Exterior Views



# Pictures (Cont.)



# Pictures (Cont.)

Access Hatch



# Pictures (Cont.)



# Pictures (Cont.)

Damaged Ladder



# Pictures (Cont.)

## Interior Sidewalls



# Pictures (Cont.)



# Pictures (Cont.)

Outlet pipe



# Pictures (Cont.)



# Pictures (Cont.)



# Pictures (Cont.)



# Pictures (Cont.)

Interior Ceiling



# Pictures (Cont.)



# Pictures (Cont.)



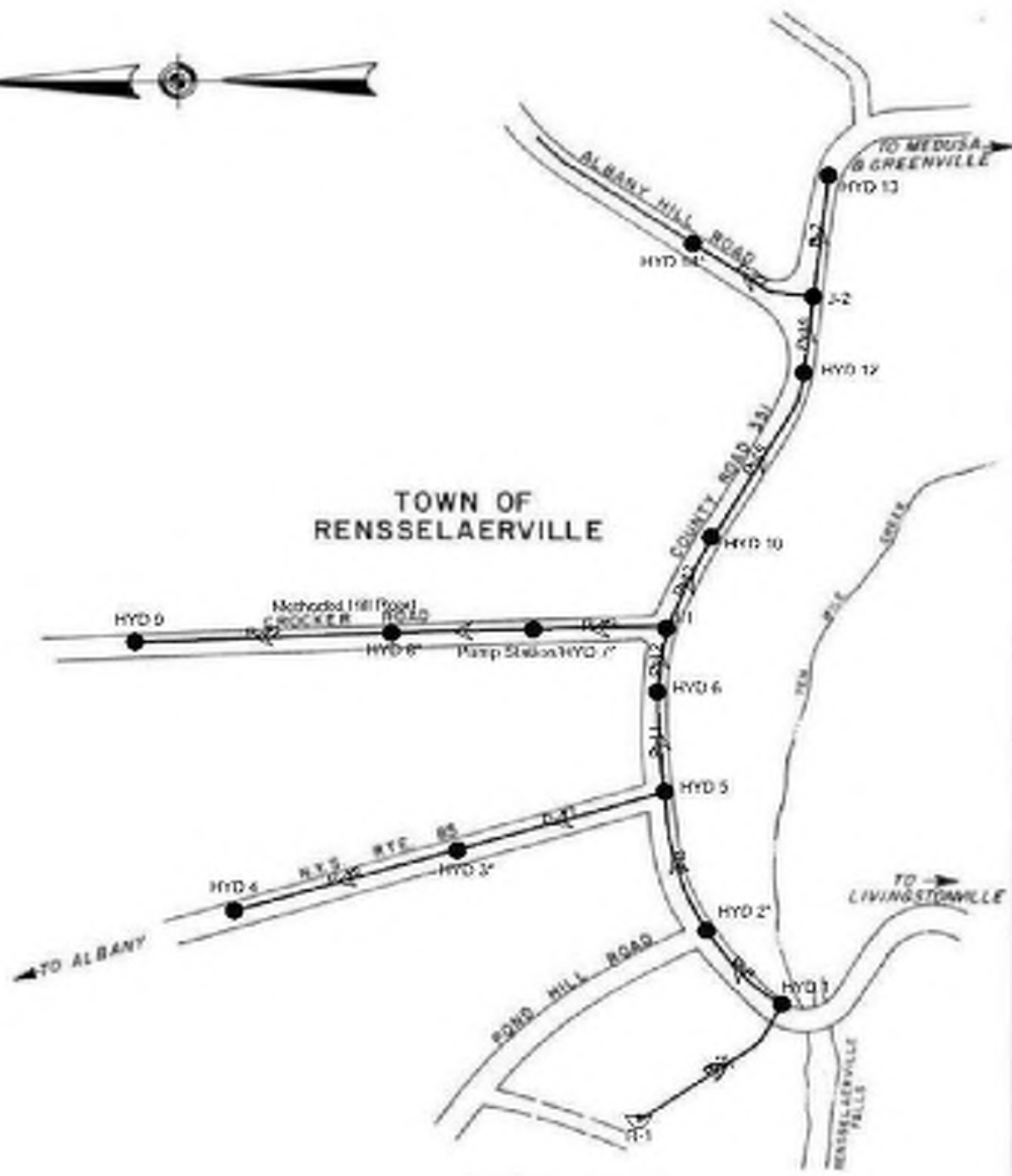


**Town of Rensselaerville - Hydrant Flow Test Results - 3/25/24**

Street Name	Flow Hydrant	Nozzle Size (inches)	QF = Flow (GPM)	Pitot (psi)	Residual Hydrant	Nozzle Size (inches)	Static Pressure (psi)	Residual Pressure (psi)	HR = Pstatic-20 (psi)	HF = Pstatic-Residual (psi)	Fire Flow Q at 20 psi	Notes*
County Road 351	HYD 5	2.5"	990	34	HYD 1	2.5"	62	60	42	2	5124	Residual hydrant was leaking some water during test
NYS RTE 85	HYD 4	2.5"	830	24	HYD 5	2.5"	54	49	34	5	2337	Hyd 5 was difficult to operate
Crocker Road/Methodist Hill Road*	HYD 9	2.5"	N/A	-	HYD 6	2.5"	56	56	36	0	#VALUE!	Little to no flow. This area is pumped. Pump station is malfunctioning currently, according to Ken it is constantly running due to broken pressure tank. Static reading at flow hydrant = 44 psi
County Road 351	HYD 10	2.5"	N/A	-	HYD 6	2.5"	56	56	36	0	#VALUE!	Flow was unable to be measured with diffuser. No drop in pressure at residual hydrant
County Road 351	HYD 13	2.5"	540	11	HYD 12	2.5"	92	12	72	80	510	

Additional Notes:

\* Tank started the day with +/- 40k gallons, dropped +/- 24" during testing period. Est. 10k gallons lost to testing



Rensselaerville DBP History			
<u>Date</u>	<u>THMs</u>	<u>HAAs</u>	<u>Notes</u>
03/01/86	46.0		
08/21/86	69.0		
12/01/86	73.0		
03/31/87	91.0		
09/03/87	59.0		
07/12/90	60.0		
09/27/93	124.0		
10/13/93	123.4		
08/25/94	84.0		
12/24/94	121.0		
03/28/95	114.0		
06/22/95	80.0		
09/25/95	85.0		
09/26/96	71.6		
01/07/97	84.3		
05/20/97	93.1		
09/30/98	73.8		
08/02/99	75.0		
09/22/00	116.0		
09/21/01	134.0		
09/26/02	56.1		
09/30/03	99.0	84.0	
09/28/04	62.5		ACHD
12/15/04	54.5	50.3	Renss
07/28/05	68.9	43.0	Renss
09/10/05	68.1		ACHD
08/10/06	141.0	12.7	Renss
09/05/06	117.0		ACHD
11/28/06	110.0	116.0	Renss
Mean	88.1	61.2	
Range	46-141	13-116	
MCL (ug/L)	80.0	60.0	

Rensselaerville disinfection byproducts (ug/L)

<b>DATE</b>	<b>THM</b>	<b>HAA</b>		
<b>April 2016</b>	40.6	<b>63</b>		
<b>July 2016</b>	<b>89.1</b>	<b>110</b>		
<b>Oct. 2016</b>	51.1	53		
<b>Feb. 2017</b>	49.6	47		
<b>June 2017</b>	25.1	10.5		
<b>Oct. 2017</b>	31.4	30.4		
<b>March 2018</b>	65.9	<b>85</b>		
<b>April 2018</b>	62	<b>81.4</b>		
<b>July 2018</b>	64.2	<b>62.8</b>		
<b>Oct. 2018</b>	75.7	<b>89.4</b>		
<b>Jan. 2019</b>	67.4	<b>76.1</b>		
<b>April 2019</b>	37.4	47		
<b>July 2019</b>	74.5	<b>64.2</b>		
<b>Oct. 2019</b>	72.8	<b>77.6</b>		
<b>Jan. 2020</b>	58	<b>79.1</b>		
<b>May 2020</b>	57.7	58.7		
<b>Aug. 2020</b>	<b>86.5</b>	<b>67.1</b>		
<b>Nov. 2020</b>	46.7	39.4		
<b>February 2021</b>	65.2	<b>71.4</b>		
<b>May 2021</b>	47.1	<b>88.6</b>		
<b>Aug. 2, 2021</b>	<b>155</b>	<b>206</b>		
<b>Aug. 27, 2021</b>	<b>105</b>	<b>128</b>		
<b>Sept. 16, 2021</b>	<b>104</b>	<b>79</b>		
<b>Oct. 4, 2021</b>	<b>87.5</b>	<b>193</b>		
<b>Oct. 21, 2021</b>	76.7	<b>125</b>		
<b>Nov. 4, 2021</b>	<b>154</b>	<b>186</b>		
<b>Dec. 2, 2021</b>	<b>112</b>	<b>145</b>		

<b>Dec. 6, 2021</b>	<b>105</b>	<b>147</b>		
<b>Feb. 2, 2022</b>	<b>93.4</b>	<b>77.2</b>		
<b>Mar. 17, 2022</b>	69.6	50.2		
<b>May 5, 2022</b>	<b>122</b>	44.9		
<b>Aug 4, 2022</b>	35.7	42		
<b>Nov 17, 2022</b>	28.6	48.8		
<b>Feb 2, 2023</b>	50.6	<b>72.3</b>		
<b>May 1, 2023</b>	66	<b>74.8</b>		
<b>Aug 2, 2023</b>	<b>104</b>	<b>83.4</b>		
<b>Nov 2, 2023</b>	<b>93.6</b>	<b>80.3</b>		
<b>RAA</b>	78.6	<b>77.7</b>		
<b>MCL (ug/l)</b>	80.0	60.0		



DANIEL P. McCOY  
County Executive

ELIZABETH F. WHALEN, MD, MPH  
Commissioner of Health

**DEPARTMENT OF HEALTH**  
COUNTY OF ALBANY  
175 GREEN STREET  
ALBANY, NEW YORK 12202

*The Dr. John J.A. Lyons*  
ALBANY COUNTY HEALTH FACILITY  
(518) 447-4580 FAX (518) 447-4698  
[www.albanycounty.com](http://www.albanycounty.com)

MARIBETH MILLER, BSN, MS  
Assistant Commissioner for Public Health

RANSOM MOORE III  
Assistant Commissioner Finance and Administration

September 15, 2023

Ed Csukas  
87 Barger Road  
Medusa, NY 12120

Re: Rensselaerville WD  
NY0100202  
Maximum Contaminant Level (MCL) Exceedance  
Notice of Violation No. 2023 3279

Dear Mr. Csukas,

This Notice of Violation (NOV) is a result of a sample collected in the monitoring period of 7/01/2023 and 9/30/2023. The locational running annual average (LRAA) concentration exceeds the Maximum Contaminant Level (MCL) for Halo acetic Acids (HAA5s). The MCL for HAA5s is 60 ug/l (micrograms per liter).

The violations are as follows:  
LRAA for HAA5 – 68.9 ug/l

You are required to notify the public within 30 days of receiving this Notice of Violation. The public notification certification form must be completed and returned to this office within 10 days of completion of public notification along with a copy of the distributed notice. Community water systems must include this violation in their 2023 Annual Water Quality Report.

If you have any questions, do not hesitate to contact the Albany County Department of Health at (518) – 447 – 4620.

Sincerely,

Maxwell Ferris, P.E.  
Director  
Division of Environmental Health Services



Albany County Department of Health is nationally accredited and meets rigorous public health standards set forth to best meet the needs of our community.

Loss of pressure in Town of Rensselaerville, Water District No. 1

## **BOIL YOUR WATER BEFORE USING**

**Bring tap water to a rolling boil, boil for one minute, and cool before using.** Or use bottled water certified for sale by the New York State Department of Health. Boiled or bottled water should be used for drinking, making ice, washing dishes, brushing teeth, and preparing food until further notice.

This Boil Water Notice applies to Residents on Methodist Hill Road who are within Water District No. 1

### **What Happened?**

Near 5:00 am on May 25, 2023 – the water system lost pressure due to a break in a pipe which filled the pump vault with water, in turn, shorting out the pump and causing it to fail. When water mains lose pressure, it increases the chance that untreated water and harmful microbes can enter your water.

*Harmful microbes in drinking water can cause diarrhea, cramps, nausea, headaches, or other symptoms and may pose a special health risk for infants, some elderly, and people with severely compromised immune systems. But these symptoms are not just caused by microbes in drinking water. If you experience any of these symptoms and they persist, you should seek medical advice.*

### **What is being done?**

The broken pipe is being repaired and a new pump is being expedited.

It is likely that you will need to boil water until further notice – at least for the next several days. You will be informed when tests show that you no longer need to boil your water.

### **For more information, please contact:**

John Rice, Operator of Rensselaerville Water District No. 1: (518) 810-7219

or the Albany County Department of Health – James Meacham: (518) 447-4620

*Please share this information with other people who drink this water, especially anyone who may not get this notice directly (for example, people in apartments, nursing homes, schools, and businesses).*

*You can do this by posting this notice in a public place or distributing copies by hand or mail.*

## **IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER**

### **Rensselaerville WD Has Levels of Turbidity Above Drinking Water Standards**

Our water system recently violated a drinking water standard. Although this is not an emergency, as our customers, you have a right to know what happened, what you should do, and what we did (are doing) to correct this situation.

We routinely monitor for the presence of drinking water contaminants. On 9/22/22, we received notice that samples collected on 16 days between 8/6/22 & 8/23/22 showed that our system exceeds the standard, or maximum contaminant level (MCL), for turbidity. The standard for turbidity is 1.0 NTU. The average level of turbidity over the last year has been 0.43 NTU.

#### **What should I do?**

- There is nothing you need to do. **You do not need to boil your water** or take other corrective actions. However, if you have specific health concerns, consult your doctor.
- If you have a severely compromised immune system, have an infant, are pregnant, or are elderly, you may be at increased risk and should seek advice from your health care providers about drinking this water.

#### **What does this mean?**

This is not an emergency. If it had been, you would have been notified within 24 hours. Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.

#### **What is being done?**

This is often a seasonal issue and it can resolve on its own. We have added a permanganate dosing pump to treat the raw water coming into the water plant. Also, a fresh charge of granular activated carbon was added to the GAC filter box early September. We anticipate resolving the problem shortly.

For more information, please contact John Rice at 518-810-7219.

*\*Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

This notice is being sent to you by Rensselaerville Water District.

State Water System ID#: 100202.

Date distributed: 10/24/2022

## **IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER**

### **Total Trihalomethanes (TTHM) & Haloacetic Acid 5 (HAA5) Violation at Rensselaerville Water District No. 1**

Our water system recently violated a drinking water standard. Although this incident was not an emergency, as our customers, you have a right to know what happened and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Testing results from May 2021 to May 2022 show that our system exceeds the standard, or maximum contaminant level (MCL), for TTHM and HAA5. The standard for TTHM is  $\leq 80$  ug/L and for HAA5 is  $\leq 60$  ug/L. It is determined by averaging all the samples collected for the past 12 months. The level of TTHM & HAA5 averaged for May 2021 to May 2022 was 102.61 ug/L and 122.49 ug/L respectively. May 5, 2022 sample results were TTHM: 122 ug/L and HAA5: 44.9 ug/L.

#### **What should I do?**

- There is nothing you need to do. You do not need to boil your water or take other corrective actions. If a situation arises where the water is no longer safe to drink, you will be notified within 24 hours.
- If you have a severely compromised immune system, have an infant, are pregnant, or are elderly, you may be at increased risk and should seek advice from your health care providers about drinking this water.

#### **What does this mean?**

This is not an emergency. If it had been an emergency, you would have been notified within 24 hours.

#### **TRIHALOMETHANES**

Trihalomethanes are a group of chemicals that are formed in drinking water during disinfection when chlorine reacts with naturally occurring organic material (e.g., decomposing vegetation such as tree leaves, algae or other aquatic plants) in surface water sources such as rivers and lakes. They are disinfection byproducts and include the individual chemicals chloroform, bromoform, bromodichloromethane, and chlorodibromomethane. The amount of trihalomethanes formed in drinking water during disinfection can change from day to day, depending on the temperature, the amount of organic material in the water, the amount of chlorine added, and a variety of other factors.

Disinfection of drinking water by chlorination is beneficial to public health. Drinking water is disinfected by public water suppliers to kill bacteria and viruses that could cause serious illnesses, and chlorine is the most commonly used disinfectant in New York State. All public water systems that use chlorine as a disinfectant contain trihalomethanes to some degree.

Some studies suggest that people who drank water containing trihalomethanes for long periods of time (e.g., 20 to 30 years) have an increased risk of certain health effects. These include an increased risk for cancer and for low birth weights, miscarriages and birth defects. The methods used by these studies could not rule out the role of other factors that could have resulted in the observed increased risks. In addition, other similar studies do not show an increased risk for these health effects. Therefore, the evidence from these studies is not strong enough to conclude that trihalomethanes were a major factor contributing to the observed increased risks for these health effects. Studies of laboratory animals show that some trihalomethanes can cause cancer and adverse reproductive and developmental effects, but at exposures much higher than exposures that could result through normal use of the water. The United States Environmental Protection Agency reviewed the information from the human and animal studies and concluded that while there is no causal link between disinfection byproducts

(including trihalomethanes) and human health effects, the balance of the information warranted stronger regulations that limit the amount of trihalomethanes in drinking water, while still allowing for adequate disinfection. The risks for adverse health effects from trihalomethanes in drinking water are small compared to the risks for illness from drinking inadequately disinfected water. (3/2016)

### **HALOACETIC ACIDS**

Haloacetic acids are disinfection byproducts formed during treatment of drinking water by chlorine, the most commonly used disinfectant in New York State. Drinking water is disinfected by public water suppliers to kill bacteria and viruses that could cause serious illnesses. For this reason, disinfection of drinking water by chlorination is beneficial to public health. The amount of haloacetic acids in drinking water can change from day to day, depending on the temperature, the amount of organic material in the source water, the amount of chlorine added, and a variety of other factors.

The following paragraph summarizes and characterizes the available studies on human populations exposed to haloacetic acids, and provides a general summary of the health effects of haloacetic acids in animals, which occur at exposure levels much higher than exposures that could result through normal use of the water.

Some studies suggest that people who drank chlorinated drinking water containing disinfection by-products (including haloacetic acids) for long periods of time (e.g., 20 to 30 years) have an increased risk for cancer. However, how long and how frequently people actually drank the water, and how much haloacetic acids the water contained is not known for certain. Therefore, the evidence from these studies is not strong enough to conclude that the observed increased risk for cancer is due to haloacetic acids, other disinfection by-products, or some other factor. Studies of laboratory animals show that the two haloacetic acids, dichloroacetic acid and trichloroacetic acid, can cause cancer following exposure to high levels over their lifetimes. Dichloroacetic acid and trichloroacetic acid are also known to cause other effects in laboratory animals after high levels of exposure, primarily on the liver, kidney, and nervous system and on their ability to bear healthy offspring. The risks for adverse health effects from haloacetic acids in drinking water are small compared to the risk for illness from drinking inadequately disinfected water. (10/2018)

### **What is being done?**

The Albany County Department of Health conducted a survey of the Rensselaerville Water System and has made some recommendations. One of those recommendations was to remove a beaver dam located upstream of the water plant intake. After receiving permission from the NYS Department of Environmental Conservation, the dam has been removed. The DOH also recommended regular flushing of the hydrants to help lessen post-treatment formation of disinfection by-products in the system's water mains. Also, with guidance from an engineering firm, modifications are being planned that would improve the quality of raw water entering the system, and thus lessening the burden on the filtration plant and improving overall water quality.

For more information, please contact Water Operator John Rice at (518) 810-7219 or email: [kenlodge@hotmail.com](mailto:kenlodge@hotmail.com).

This notice is being sent to you by the Town of Rensselaerville Water District No. 1.  
State Water System ID#: 100202  
Date distributed: 07/08/2022

## **IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER**

### **Total Trihalomethanes (TTHM) & Haloacetic Acid 5 (HAA5) Violation at Rensselaerville Water District No. 1**

Our water system recently violated a drinking water standard. Although this incident was not an emergency, as our customers, you have a right to know what happened and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Testing results from February 2021 to February 2022 show that our system exceeds the standard, or maximum contaminant level (MCL), for TTHM and HAA5. The standard for TTHM is  $\leq 80$  ug/L and for HAA5 is  $\leq 60$  ug/L. It is determined by averaging all the samples collected for the past 12 months. The level of TTHM & HAA5 averaged for February 2021 to February 2022 was 103 ug/L and 126 ug/L respectively. February 2, 2022 sample results were TTHM: 93.4 ug/L and HAA5: 77.2 ug/L.

#### **What should I do?**

- There is nothing you need to do. You do not need to boil your water or take other corrective actions. If a situation arises where the water is no longer safe to drink, you will be notified within 24 hours.
- If you have a severely compromised immune system, have an infant, are pregnant, or are elderly, you may be at increased risk and should seek advice from your health care providers about drinking this water.

#### **What does this mean?**

This is not an emergency. If it had been an emergency, you would have been notified within 24 hours.

#### **TRICHALOMETHANES**

Trihalomethanes are a group of chemicals that are formed in drinking water during disinfection when chlorine reacts with naturally occurring organic material (e.g., decomposing vegetation such as tree leaves, algae or other aquatic plants) in surface water sources such as rivers and lakes. They are disinfection byproducts and include the individual chemicals chloroform, bromoform, bromodichloromethane, and chlorodibromomethane. The amount of trihalomethanes formed in drinking water during disinfection can change from day to day, depending on the temperature, the amount of organic material in the water, the amount of chlorine added, and a variety of other factors.

Disinfection of drinking water by chlorination is beneficial to public health. Drinking water is disinfected by public water suppliers to kill bacteria and viruses that could cause serious illnesses, and chlorine is the most commonly used disinfectant in New York State. All public water systems that use chlorine as a disinfectant contain trihalomethanes to some degree.

Some studies suggest that people who drank water containing trihalomethanes for long periods of time (e.g., 20 to 30 years) have an increased risk of certain health effects. These include an increased risk for cancer and for low birth weights, miscarriages and birth defects. The methods used by these studies could not rule out the role of other factors that could have resulted in the observed increased risks. In addition, other similar studies do not show an increased risk for these health effects. Therefore, the evidence from these studies is not strong enough to conclude that trihalomethanes were a major factor contributing to the observed increased risks for these health effects. Studies of laboratory animals show that some trihalomethanes can cause cancer and adverse reproductive and developmental effects, but at exposures much higher than exposures that

could result through normal use of the water. The United States Environmental Protection Agency reviewed the information from the human and animal studies and concluded that while there is no causal link between disinfection byproducts (including trihalomethanes) and human health effects, the balance of the information warranted stronger regulations that limit the amount of trihalomethanes in drinking water, while still allowing for adequate disinfection. The risks for adverse health effects from trihalomethanes in drinking water are small compared to the risks for illness from drinking inadequately disinfected water. (3/2016)

### **HALOACETIC ACIDS**

Haloacetic acids are disinfection byproducts formed during treatment of drinking water by chlorine, the most commonly used disinfectant in New York State. Drinking water is disinfected by public water suppliers to kill bacteria and viruses that could cause serious illnesses. For this reason, disinfection of drinking water by chlorination is beneficial to public health. The amount of haloacetic acids in drinking water can change from day to day, depending on the temperature, the amount of organic material in the source water, the amount of chlorine added, and a variety of other factors.

The following paragraph summarizes and characterizes the available studies on human populations exposed to haloacetic acids, and provides a general summary of the health effects of haloacetic acids in animals, which occur at exposure levels much higher than exposures that could result through normal use of the water.

Some studies suggest that people who drank chlorinated drinking water containing disinfection byproducts (including haloacetic acids) for long periods of time (e.g., 20 to 30 years) have an increased risk for cancer. However, how long and how frequently people actually drank the water, and how much haloacetic acids the water contained is not known for certain. Therefore, the evidence from these studies is not strong enough to conclude that the observed increased risk for cancer is due to haloacetic acids, other disinfection by-products, or some other factor. Studies of laboratory animals show that the two haloacetic acids, dichloroacetic acid and trichloroacetic acid, can cause cancer following exposure to high levels over their lifetimes. Dichloroacetic acid and trichloroacetic acid are also known to cause other effects in laboratory animals after high levels of exposure, primarily on the liver, kidney, and nervous system and on their ability to bear healthy offspring. The risks for adverse health effects from haloacetic acids in drinking water are small compared to the risk for illness from drinking inadequately disinfected water. (10/2018)

### **What is being done?**

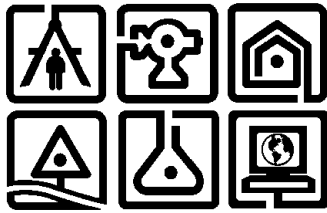
The granular activated carbon filter was refreshed with new carbon on March 3<sup>rd</sup>. On the basis of analyses of both our raw and finished water, done by an independent laboratory, our GAC filter design firm, East Coast Filter, is recommending that we try changing the type of Granular Activated Carbon used in our filter to one based on materials different than the carbon we have used in the past. This may be done after one more sets of tests are performed using the recently installed carbon to see if we have succeeded in further reducing DBP levels to within recommended ranges.

For more information, please contact Water Operator John Rice at (518) 810-7219 or email: kenlodge@hotmail.com.

This notice is being sent to you by the Town of Rensselaerville Water District No. 1.  
State Water System ID#: 100202  
Date distributed: 03/09/2022

APPENDIX C  
SOURCE WATER ASSESSMENTS

March 6, 2024



# Identification and Evaluation of Alternative Source Water Sites

Hamlet of Rensselaerville  
Albany County, New York

*Prepared for:*  
Water District #1  
Town of Rensselaerville  
87 Barger Road  
Medusa, NY 12120

*Prepared by:*  
C.T. MALE ASSOCIATES  
50 Century Hill Drive  
Latham, New York 12110  
(518) 786-7400  
FAX (518) 786-7299

*C.T. Male Associates Project No: 24.4005*

**IDENTIFICATION AND EVALUATION OF ALTERNATIVE  
SOURCE WATER SITES  
HAMLET OF RENNELAERVILLE  
ALBANY COUNTY, NEW YORK**

**TABLE OF CONTENTS**

	<b><u>Page</u></b>
1.0 Introduction .....	3
2.0 Review of Previous Groundwater Studies .....	5
2.1 Topography and Hydrology .....	5
2.2 Surficial Geology .....	5
2.3 Bedrock Geology .....	6
2.4 Groundwater Resources.....	7
2.4.1 Unconsolidated Aquifers .....	7
2.4.2 Bedrock Aquifers .....	7
3.0 Review of Previously Identified and/or New Potential Groundwater Supply Source Sites.....	9
3.1 Potential Unconsolidated Sources .....	9
3.2 Potential Bedrock Sources .....	10
4.0 Source Water Analysis for Each Selected Drinking Water Source Alternative .....	12
4.1 Source Water Analysis - Option 1 (Unconsolidated Aquifer between Hicks/Lincoln Pond and Lake Myosotis) .....	13
4.2 Source Water Analysis - Option 2 (Bedrock Aquifer, North of Rensselaerville Volunteer Fire Company, Inc., (4990 Delaware Turnpike)) .....	16
4.3 Source Water Analysis - Option 3 (Bedrock Aquifer, North of Rensselaerville Volunteer Fire Company, Inc., (4990 Delaware Turnpike)) .....	20

**FIGURES**

Figure 1	Topography and Water Bodies
Figure 2	Public and Privately Owned Lands
Figure 3A	Surficial Geology

Figure 3B            Unconfined Aquifers  
Figure 4            Bedrock Geology

**APPENDICES**

Appendix A            Potential Development of Groundwater Supply Source for Hamlet  
                                 of Rensselaerville, New York  
Appendix B            Letter to Town Board RE: Proposed Water Supply Investigation  
                                 (Hamlet of Rensselaerville)

## 1.0 INTRODUCTION

The Rensselaerville Water District (Water District), Public Water Supply (PWS) ID# NY0100202, serves a portion of the hamlet of Rensselaerville (Hamlet) in the Town of Rensselaerville (Town). The PWS system serves approximately 200 persons through approximately 80 service connections, is not metered, and includes a distribution system that is mostly gravity fed. One portion of the Water District, due to topography, relies on a pump system to receive water. The PWS system supplies between 12,000 and 18,000 gallons per day (GPD) to the Water District (Figures 1 and 2). The intake of the Town's drinking water is downstream of Lake Myosotis, located within Tenmile Creek. The water filtration plant located at the intake was built in 1942 and employs a multi-step process to purify drinking water. First, the surface water passes through a settling chamber to remove particulates and cleaned by a slow sand filter. During summer months, aeration is also used prior to the slow sand filter to raise the dissolved oxygen levels. The filtered source water then flows through a granular activated carbon (GAC) adsorber, a master meter, and is disinfected by a continuous sodium hypochlorite feed that then flows to an underground 50,000-gallon concrete clear well that was constructed in 1952. Potable water from the clear well flows by gravity to the Water District's ductile iron distribution system, replaced in the 1980's. The Water District installed a stand-alone GAC filter in August of 2021 to mitigate exceedances for total trihalomethane (TTHM) and haloacetic acids (HAA5).

Future expansion of the existing PWS system was not expected due to major costs to resolve existing water quality problems. Deficiencies with the PWS system are as follows:

- Existing treatment systems are overloaded under high demand conditions.
- No redundancy
- No flow control to the inlet filter/excess water is wasted through overflows
- No master metering on the system
- Raw water piping from the diversion dam to the filter is operating at capacity
- Existing filter structure and chlorination building are in need of repair
- Recommendation: Individual house service meters.

The source water and the PWS system is old and has experienced numerous water quality issues. The Water District has commissioned C.T. Male to identify if groundwater in the immediate vicinity offers as a suitable alternative to meet the Water District's water quantity and quality demands for the community. The hydrogeologic evaluation of alternative source water sites includes an overview of previous groundwater studies (Section 2.0) and previously identified potential groundwater exploration sites (Section

3.0). Also, C.T. Male provides a source water analysis for each selected alternative source for drinking water (Section 4.0).

## 2.0 REVIEW OF PREVIOUS GROUNDWATER STUDIES

*(References Reviewed: Arnow, 1949; Kantrowitz & Snavely, 1982; Bugliosi and Trudell, 1987; New York Rural Water Association (NYRWA), 2007; and, Water District, 2021)*

### 2.1 Topography and Hydrology

The Town is located on the Helderberg Plateau in southwestern Albany County and serves as the extreme northeastern extension of the Appalachian Uplands physiographic province (Figure 1). The Helderberg Plateau represents a peneplain which was once a continuous plain extending across the Hudson Valley and gradually slopes upward toward the Catskill Mountains. The peneplain is interspersed with occasional residual hills due to outcrops of more resistant rock. The hills throughout the Town have shapes and trends related to bedrock features, as well as the erosional influence by previous glacial activity. While bedrock joints are generally parallel to the trend of the hills, glaciation modified the hills in the general direction of ice flow. The north-northeast to south-southwest orientation of hills in the study area reflects this influence of ice flow.

The study area topography exhibits considerable relief. Elevations range from 1,650 feet amsl to 2,000 feet amsl in the vicinity of the Hamlet to 1,250 feet amsl in the Tenmile Creek valley - the extreme southern portion of the Hamlet (Figure 1).

The majority of the Town is drained by the Catskill Creek which flows southeast across the southwestern corner of the Town to the Hudson River (Figure 1). The study area is principally drained by the north to south-flowing Tenmile Creek, a sub-basin to the Catskill Creek. The central area of the Town is also composed of a series of north to south valleys which all drain south to the Catskill Creek. The northwest and northeast corners of the Town drain northwest to the Schoharie Creek and then to the Mohawk River (Figure 1).

### 2.2 Surficial Geology

Three (3) types of glacial material are encountered in the Town and study area:

- Glacial till (poorly sorted diamict of unstratified drift);
- Ice-contact deposits such as kames, eskers, kame terraces, kame deltas, and kame moraines; and,
- Glacial outwash.

Glacial till is an unsorted mixture of clays, silts, sands, and angular rock deposited directly by the advancing and receding Wisconsinan glacier. These deposits are mapped

in the vicinity of Lake Myosotis and hills east and northeast of the Hamlet (Figure 3A). Ice-contact deposits, such as kames and kame moraines, formed by running water along a progressively northward or northeastward-receding ice margin are located on portions of the valley walls adjacent to Tenmile Creek and are also evident in the vicinity of Shoefelt Corners and the hills within the Tenmile Creek sub-basin east and southeast of the Hamlet (Figure 3A). Meltwater from the ice sheet also transported large amounts of sand and gravel and deposited it as outwash on the valley floor downstream from the retreating glacier. Outwash sand and gravel is generally found in the Tenmile Creek valley within the study area (Figure 3A).

### **2.3 Bedrock Geology**

The bedrock within the Town was formed approximately 370 to 390 million years ago during the Middle Devonian period when the study area was covered by a warm, shallow sea. During the Acadian Orogeny tremendous quantities of mud, silt, sand, and gravel were eroded from the Acadian Mountains and deposited into the inland sea forming the Catskill Delta. The bedrock encountered within the study area and the Town is derived from these earliest deposits into the inland sea.

As these sediments accumulated, their weight compressed underlying sediments. Groundwater percolating through the sediments dissolved minerals and redeposited them as cements, thereby turning silts and sands into siltstones and sandstones and sand and gravel mixtures into conglomerates. Erosional dissection of the flat-lying sandstones and shales of the region and subsequent glaciation formed the current landscape within the study area. Sedimentary bedding in the study area, including the Edmund N. Huyck Preserve, dips at 2 degrees to the southwest (Fleischer).

The study area (Tenmile Creek valley and Switz Kill watershed) is mostly underlain by Middle Devonian sandstones and shales of the Undifferentiated Lower Hamilton Group (Figure 4), which is the oldest bedrock formation in the region. Lithologic variations, sedimentary structures and bedding characteristics are evident in this portion of the Town and provide clues to the study area's depositional environment. One of the best exposures of this bedrock unit and the overlying Plattekill/Ashokan formation is located in the gorge at Rensselaerville Falls.

Above the Undifferentiated Group is the Plattekill/Ashokan formation which consists of non-marine sandstones and interbedded green shales that weather red and/or brown. Maximum thickness of this formation is 350 feet (Arnow, 1949). The "Ashokan" underlies Hicks/Lincoln Pond, Lake Myosotis and lands east and west (commonly outcropping) of the Tenmile Creek valley (Figure 4).

The youngest bedrock in the study area consists of shales and sandstones from the Moscow formation, located at the top of hills southwest of Lake Myosotis and the northwestern portion of the Fox Creek sub-basin (Figures 1 and 4). The presence of the Moscow formation is not significant as it pertains to this study.

Bedrock is generally covered by surficial deposits within the study area as discussed below.

## **2.4 Groundwater Resources**

C.T. Male reviewed all groundwater studies that provided coverage of the hydrogeologic setting in the Town and study area. In addition to evaluating bedrock and unconsolidated private and public water well data, the review was also applied to specific groundwater recharge and discharge areas and potential groundwater contamination sources within the study area. This information was primarily incorporated into the strategies of selecting the most suitable groundwater source, if applicable, as a water supply alternative(s). A summary of that work is as follows:

### **2.4.1 Unconsolidated Aquifers**

Based on the distribution of more transmissive units (ice-contact and glacial outwash deposits) as presented in Section 2.2, the mapped presence of primary and principal unconsolidated aquifers within the Town and study area are shown on Figure 3B. There are very few unconsolidated aquifers located within the study area – identified as thin alluvial deposits in the southeastern portion of the Hamlet and north-northwest of Lake Myosotis. The most productive unconsolidated aquifer (Shoefelt Corners corridor and east) was viewed as too far away from the Water District to provide further aquifer evaluation and exploration. Other unconsolidated water wells in the Town, located in areas with pronounced outwash sand and gravel deposits, have a reported median yield of 12 gallons per minute (gpm) (NYRWA, 2007). Little water quality data exists on these types of wells within the study area.

### **2.4.2 Bedrock Aquifers**

Most water supply wells in the area found in the valleys and along streams use local bedrock formations with an average well yield of 15.1 gpm and a median yield of wells at 7.5 gpm. However, 20% of all bedrock water wells in the Town have reported yields of at least 20 gpm which includes water well A001172 (132 feet deep, short term yield of over 22 gpm) within the study area. Documented short-term well yields for water wells completed in the target rock (Undifferentiated Lower Hamilton Group) within the study area ranged from 5 gpm to greater than 22 gpm. It should be noted that these rates are driller estimates from short-term yield tests and the subject well(s) established for the

Water District will require more strict and reliable yield testing information. In the areas of Town with the highest elevations, such as the Moscow formation, wells have reported a lesser median yield of 6 gpm.

Water quality data indicates that the majority of bedrock water wells in the Town have elevated levels of iron (above the maximum contaminant level (MCL)). NYRWA also reported the presence of hydrogen sulfide and elevated chloride concentrations in deeper water wells within the Town and study area.

### 3.0 REVIEW OF PREVIOUSLY IDENTIFIED AND/OR NEW POTENTIAL GROUNDWATER SUPPLY SOURCE SITES

*(References Reviewed: Clough Harbor, 1993; Randall, 1995; Gowan, 1995; Fishman, 1996; and NYRWA, 2007)*

#### 3.1 Potential Unconsolidated Sources

Mr. Randall identified three (3) potential unconsolidated aquifers and one (1) bedrock aquifer in the vicinity of the Hamlet (Appendix A). The first area (Area A) identified a heterogeneous ice-contact stratified drift (moraine-derived) deposit that occasionally consisted of coarse sand and gravel east and southeast of Shoefelt Corners (Figure 3A). This area reflects the greatest potential for large capacity wells with well yields of a few hundred gallons per minute being plausible. Review of boring logs in the vicinity indicate the thickness of transmissive soils and depth to top of bedrock is most shallow in the vicinity of Shoefelt Corners and likely offers the greatest (totaling 55.4 acres in the vicinity and east of Shoefelt Corners) potential yield but is located approximately one (1) mile north of the subject community served by the Water District. The thickness of this saddle deposit is highly variable and could be as deep as 94 feet below grade or more. Following exploration, an infiltration gallery or traditional water well construction may serve to provide the anticipated water demand but, due to its location was viewed as too far from the existing distribution system.

Mr. Randall also identified potential saturated gravel at the valley floor, mapped as Area B, between Hicks/Lincoln Pond and Lake Myosotis which located slightly less than one mile northwest of the PWS source (Figure 3A). Following exploration (seismic survey to determine thickness of soils and aquifer testing), an infiltration gallery or traditional water well construction(s) may serve to meet the anticipated water demand and water quality for the Water District. Given its location (Environmental Conservation Area and close proximity to PWS system) this unconsolidated aquifer is further defined as Option 1 for being a potential target or alternative water supply source for the Water District.

Alluvial gravels near 10 feet in thickness have been identified along the floor of the Tenmile Creek valley and extend approximately 100 to 2,000 feet south of the Hamlet (Figure 3A). Following exploration (test pitting to determine thickness of soils and shallow water well drilling and aquifer testing), an infiltration gallery may serve to meet the anticipated water demands for the Water District. However, there is limited data demonstrating that this alluvial deposit is actively being used as a drinking water supply source; given its thin distribution, sensitivity to drought and potential environmental contaminant threats, and likely higher permitting costs to address if groundwater is under the direct influence (GWUDI) of surface water (e.g., Tenmile Creek) this alternative was waived from further consideration.

No other unconsolidated aquifers have been identified by others or were deemed worthy of further exploration as a groundwater resource based on our experience and review of various groundwater studies.

### **3.2 Potential Bedrock Sources**

Steeply deeply dipping joints have been mapped as being nearly vertical in the Town and study area (Isaachsen and Mckendree, 1977). Fractures and fracture zones also represent areas of deeper weathering, greater erosion and differences in soil characteristics that may also impact vegetation type. These characteristics manifest themselves as linear, visual and topographic features that are observable from review of aerial photographs and topographic maps. Conceptually, target bedrock groundwater supply sources are identified as being locations of intersecting a zone of closely spaced joints and/or other mapped photolinear features. Randall reported that two (2) photolinear features, mapped as being south of the Hamlet, can be readily projected to linear features identified within the Hamlet.

The identification of potential well sites from a fracture trace analysis was completed by Gowan in 1995 to identify potential areas where groundwater is stored within and flows along fractures in the underlying bedrock (Appendix B). Gowan reported that the majority of the linears were short, northeast-trending features that likely represented fractures in the bedrock referred to as joints (Figure 4). In addition, a few more prominent (e.g., major) north to south-oriented linears were identified proximal to the Tenmile Creek valley that extend for several thousand feet. These longer linears may be larger, regional fractures or faults that cut across the above referenced nearly vertical joints (Figure 4). One of these major linears extends from the south side of the Hamlet northward crossing Route 85 at a point approximately 1,500 feet east of Shoefelt Corners. A second major linear within the Hamlet follows Route 85 northward and passes approximately 600 feet west of Shoefelt Corners.

Four (4) target areas were identified for potential higher yielding bedrock (Undifferentiated Lower Hamilton Group) water wells within the Hamlet. In all cases, these target areas represented the intersection of a major mapped linear with a northeast-oriented linear. In theory, the connection of likely fractures in local bedrock to nearly vertical joints systems could have the potential for supporting the potable water needs for the Water District as long as the subject wells are not drilled too deep and encounter elevated hydrogen sulfide or chloride concentrations as noted from our previous review of available literature, reports, and well records.

Target areas 1 and 4, identified by Gowan, were waived from further consideration at this time either because they did not provide as strong evidence of good water quality or access (Target Area 1) or were viewed too far from the Water District's existing

distribution system (Target Area 4). From this point forward, target areas north of the Town park and north of the fire station are referred to as Options 2 and 3, respectively.

#### 4.0 SOURCE WATER ANALYSIS FOR EACH SELECTED DRINKING WATER SOURCE ALTERNATIVE

This section describes potential options to provide an alternate drinking water source for the Water District and identifies the basic requirements for implementing each, along with order of magnitude cost estimates, schedule, and other pertinent details. Potential combinations of one or more sources were considered during the development of this study; however, none were selected for advancement because an independent option for each source type was identified. Each source water option was scored against the nine (9) criteria listed as follows:

- Compliance with legal requirements: This criterion assesses whether an option conforms to official standards, criteria, and guidance that are directly applicable or that are relevant and appropriate.
- Overall protection of human health and the environment: All of the alternatives considered would provide a permanent drinking water supply; however, there are differences between the alternatives in their long-term maintenance needs and future risk mitigation considerations. All of the alternatives would be capable of supplying both the current and conceptual future maximum day potable water demands.
- Long-term effectiveness and permanence: This criterion evaluates the long-term effectiveness and permanence of an option *after* implementation. In a typical source water feasibility study, this is evaluated in relation to how effectively the option eliminates site contamination and how any residual contamination can be controlled to prevent human exposure or environmental impact. Since this Report primarily assesses option sources of water for the subject community, this criterion is used here to evaluate *how effectively* an option can provide a water supply to the Water District over the long term. This assessment contemplates how each of the alternatives considered would provide a permanent drinking water supply; however, there are differences between the alternatives in their long-term maintenance needs and future risk mitigation considerations. All of the alternatives have the potential of supplying both the current and/or conceptual future peak daily potable drinking water demands.
- Reducing toxicity, mobility, and volume: This criterion is typically used to evaluate source water alternatives that are designed to reduce the toxicity, mobility, or volume of contamination at a contaminated site. This criterion is not evaluated in detail in this report.
- Short-term effectiveness: This criterion evaluates the potential short-term adverse environmental impacts and human exposures during the implementation of an option. As noted above, this assessment contemplates the sand filter and GAC, or equivalent, water treatment system remaining in place to provide potable water during the design and construction of Options 1, 2 or 3.

- Implementability: This criterion evaluates the technical and administrative feasibility of implementing an option. This includes assessing the technology involved in the option, construction challenges during implementation, and the level of permitting and approvals required for each option.
- Cost: This criterion examines the cost effectiveness of each option to determine if the costs are proportional to the overall effectiveness. The overall effectiveness is an evaluation of three (3) criteria (long-term effectiveness, reduction in toxicity, mobility or volume, and short-term effectiveness). Overall effectiveness is compared to cost to assess whether the alternative's cost is proportional to its overall effectiveness.
- Environmental impact and sustainability: This criterion weighs how green remediation concepts, such as minimizing energy consumption, maximizing the reuse of land and the recycling of materials, and conserving natural resources helps to achieve the reliable supply of a drinking water supply source. Also, this criterion assesses opportunities to increase sustainability that exist throughout the exploration, design, permitting, construction and site management phases of source supply. For the purposes of this cost-benefit analysis each option was not scored against this green and/or sustainability criterion.
- Community acceptance: This "last remedy" selection criterion is typically taken into account after evaluating those above and after public comments have been received on the proposed alternative water supply. For the purposes of this cost-benefit analysis each option was not weighed against this modifying criterion.

The final stage of the analysis includes the application of scoring to compare the listed water supply source alternatives. A Low (1), Moderate (2), or High (3) scoring terminology was applied to each specific criterion and each option was scored based on the ability that the criterion is met by the specific corrective action alternative. Based on the results of this evaluation, a summary of each water supply source alternative and its ability to meet the objectives of the State Standard provided in Section 2.0.

#### **4.1 Source Water Analysis - Option 1 (Unconsolidated Aquifer between Hicks/Lincoln Pond and Lake Myosotis)**

This option involves the drilling/installation/sampling/testing/permitting of unconsolidated water supply wells on the lands north of Lake Myosotis. This option would only serve the existing Water District users. C.T. Male reviewed the possibility of connecting to the existing small-scale distribution system supplied by a new water supply source via drilled sand and gravel potable water wells on lands owned by the Edmund Niles Huyck Preserve (Tax Parcel I.D. #: 136.-1-27) that are higher in elevation than and slightly more than one (1) mile from the existing distribution system. Based on

our review, the presence of transmissive sand and gravel deposits and the depth to bedrock (Lower Differentiated Hamilton Group) is not known. Mr. Randall did identify potential saturated gravel at the valley floor, mapped as Area B (Figure 3A), northwest of the existing PWS source (Figure 3A). Following exploration (seismic survey to determine thickness of soils and aquifer testing), an infiltration gallery or traditional water well construction(s) may serve to meet the anticipated water demand and water quality for the Water District. Given its location (owned by Huyck Preserve), unmapped sand and gravel deposits may exist on the valley floor based on our understanding of the glacial geologic setting. C.T. Male recommends drilling at this target area for high yield unconsolidated water wells if Options 2 or 3 are not productive. To optimize water quantity and quality, it is suggested that an infiltration gallery be explored to increase overall capture. For purposes of this analysis, it is assumed two (2) to four (4) supply wells would be required to meet the demands of the Water District and fulfill NYSDOH and NYSDEC source water requirements.

Each PWS test well will be drilled, developed, and sampled to compare to NYSDOH Part V criterion and assess if sufficient water quantity can be attained. Preliminary site characterization of each target test well would be required and will include grain size analysis and groundwater sampling within the key water bearing zone of the sand and gravel unit, if encountered. If the site characterization does not identify the presence of poor water quality or insufficient initial yield in the sand and gravel, a step test program and 72-hour constant rate pumping test will be performed to confirm that the subject well can achieve the Water District's water quantity demands. If the pumping test is successful and meets the stated goals, an additional groundwater sample will be collected at the end of each constant rate pumping test.

If the groundwater quality indicates that no significant treatment is required and sufficient water quantity can be attained, each test well (or infiltration gallery) can be connected to the existing distribution system for the Water District once an Engineering Report and associated public drinking water permitting documents have been submitted to and approved by the Albany County Department of Health, New York State Department of Health, and New York State Department of Environmental Conservation. Once the connections have been completed and demonstrate to be in compliance with State and Federal drinking water standards and guidelines the existing treatment building will be decommissioned in accordance with NYS procedures.

If selected, this option would delay implementation of a long-term solution until after the new water supply well(s) demonstrate that the alternative water supply source can safely provide the available capacity and sufficient water quality to meet the Water District's requirements. For this option to be implemented, the Town and Water District would have to commit to a phased approach and keep operations of the existing PWS system in

compliance until the site characterization and unconsolidated aquifer evaluation is being performed at this location.

The estimated initial capital cost and optional yearly O&M cost is \$3.6 million and \$10,000, respectively. The total cost for Option 1 would be the highest and assumes distribution system design, easements, well rehabilitation, and construction will be no different than what C.T. Male has encountered for other PWS systems that have unconsolidated aquifers as their source. C.T. Male further assumes that each water well will be of similar depth (less than 50 feet below grade) and the location(s) will be accessible by a truck-mounted drill rig and water treatment has the potential to not be required. This cost estimate does not include environmental permitting or an increase in the Water District’s water main diameter.

An advantage of Option 1 is its location, being solely within the Huyck Preserve but the subject aquifer may have limitations such as being subject to drought and require a pump station to pipe the raw water a distance of slightly more than one (1) mile. Option 1, if deemed feasible, could be executed at significantly higher costs to operate and maintain than other targets in the vicinity because the longer distance to the existing distribution main and maintenance of pump station and overburden wells. Another disadvantage of this option remains uncertainty given our limited knowledge of existing conditions. This option is currently recommended as the third best target by C.T. Male given the lack of groundwater quantity and quality information in the vicinity of the Water District.

<b>OPTION 1</b>		
<b>Bedrock Potable Water Wells North of Town Park and West of Albany Hill Road</b>		
<b>Tax Parcel I.D. #: 136.-1-27, Lands Owned by Edmund Niles Huyck Preserve</b>		
<b>Feasibility Criterion</b>	<b>Scoring (_ of 3)</b>	<b>Advantages/Disadvantages</b>
Compliance	2	Sampling of each cased unconsolidated water supply well will be tested for NYSDOH Part V parameters. This method assumes no treatment for PFAS or removal of other nuisance parameters, besides chlorination, will be required to mitigate the subject unconsolidated aquifer. It is possible that Option 1 could comply with SCGs but is not as certain as Option 2.
Protection of Human Health & the Environment	3	The subject wells at this location could be affected by movement of unknown contaminants over time but is less likely when compared to Option 3.
Long-term effectiveness and permanence	2	Option 1 would require up to four (4) test wells to fulfill production wells for redundancy. Each new groundwater supply source(s) would be proven to not require additional pretreatment, based on site characterization, aquifer testing, and monitoring. The primary disadvantage of this option

		remains uncertainty given our limited knowledge of existing conditions and sensitivity to drought. C.T. Male is unable to predict the groundwater chemistry over time without collecting additional aquifer testing information.
Reducing toxicity, mobility, and volume	3	This option is designed to provide drinking water from the local unconsolidated aquifer within lands owned by the Huyck Preserve at optimal location based on our assessment of glacial geology.
Short-term effectiveness	2	Option 1 would require the conversion of the test wells to production wells and the construction of a gravity fed water main to connect to the Water District's distribution system. Option 1 would require land disturbance to enable driller access for the subject groundwater exploration and for the connection to the existing water transmission main. Construction would have minor short-term impacts to the community, such as noise. Stormwater pollution during construction would be mitigated using standard erosion and sediment controls. For this option to be implemented, the Town and Water District would also need to commit to a phased approach and maintain the existing PWS while the subject aquifer evaluation is being executed.
Implementability	2	Option 1 would require access from the Huyck Preserve for the seismic survey and converting onsite test wells to production wells as a replacement source of water for the Water District and its users. Option 1, like Options 2 and 3, would require approvals from the NYSDEC, Albany County DOH, and NYSDOH. The technical feasibility of this option is known and involves standard protocols to install well pump components, conduct pumping tests, aquifer and drinking water analysis, and installation to connect to the existing distribution system.
Cost	1	For the purpose of direct comparison, Option 1 has the greatest estimated capital cost (\$150,000 per well). Option 1 would have the lowest future costs as no groundwater treatment would likely be required. The future O&M costs for this option are considered optional as previously described.

**TOTAL: 15**

**4.2 Source Water Analysis - Option 2 (Bedrock Aquifer, North of Rensselaerville Volunteer Fire Company, Inc., (4990 Delaware Turnpike))**

This option involves the drilling/installation/sampling/testing/permitting of bedrock water supply wells on the parcel north of the Town Park and west of Albany Hill Road. This option would also only serve the existing Water District users. C.T. Male reviewed the possibility of connecting to the existing small-scale distribution system supplied by a new water supply source via drilled bedrock potable water wells on lands owned by the

Huyck Preserve that are higher in elevation than and within ½ mile of the existing distribution system. Based on review, the depth to bedrock (Lower Differentiated Hamilton Group) is likely between 50 to 75 feet below grade that is at least partially overlain by transmissive glacial outwash sand and gravel deposits that constitute as a mapped principal unconsolidated aquifer. C.T. Male recommends drilling at this target area for high yield, cased water wells because Option 2 lands are owned by the Huyck Preserve at a location of the intersection of mapped photolinears where nearly vertical joints intersect with the major fracture trace within the Tenmile Creek valley and are furthermore overlain by a mapped unconsolidated aquifer. To optimize water quantity and quality, it is suggested that the subject groundwater exploration within Option 2 be limited to 375 feet below grade or less. Depth, pump specifications, and other factors can be controlled when installing/testing each prospective water supply well. For purposes of this analysis, it is assumed two (2) supply wells will be installed to fulfill the demands of the Water District and NYSDOH and NYSDEC source requirements.

Each cased PWS test well will be drilled, developed, and sampled to compare to NYSDOH Part V criterion and assess if sufficient water quantity can be attained. Preliminary site characterization of each target test well would be required and will include groundwater sampling within the key water bearing zone within the open hole rock column. The objective of this exploratory investigation is similar to as described for Option 3. If the site characterization does not identify the presence of poor water quality in bedrock groundwater, a step test program and 72-hour constant rate pumping test will be performed to confirm that the subject well can achieve the Water District's water quantity demands. If the pumping test is successful and meets the stated goals an additional groundwater sample will be collected at the end of each constant rate pumping test.

If subject bedrock groundwater quality indicates no significant treatment is required (e.g., chlorides, hydrogen sulfide, total dissolved solids, specific conductance, iron, and manganese) and sufficient water quantity can be attained, each bedrock test well can be connected to the existing distribution system for the Water District once an Engineering Report and associated public drinking water permitting documents have been submitted to and approved by the Albany County Department of Health, New York State Department of Health, and New York State Department of Environmental Conservation. Once the connections have been completed and demonstrate to be in compliance with State and Federal drinking water standards and guidelines the existing treatment building will be decommissioned in accordance with NYS procedures.

If selected, this option would delay implementation of a long-term solution until after the new bedrock water supply well(s) demonstrate that the alternative water supply source can safely provide the available capacity and sufficient water quality to meet the Water District's requirements. For this option to be implemented, the Town and Water District

would have to commit to a phased approach and keep operations of the existing PWS system in compliance until the site characterization and bedrock aquifer evaluation is being performed at this location.

The estimated initial capital cost and optional yearly O&M cost is \$2.0 million and \$10,000, respectively. The total cost for Option 2 would be the lowest and assumes distribution system design, easements, well rehabilitation, and construction will be no different than what C.T. Male has encountered for other PWS systems that have bedrock groundwater as its source. C.T. Male further assumes that each bedrock well will be of similar depth to private water wells drilled in the surrounding area (less than 375 feet below grade) and the location(s) will be accessible by a truck-mounted drill rig and water treatment has the potential to not be required. This cost estimate does not include environmental permitting or an increase in the Water District’s water main diameter.

An advantage of Option 2 is the lower capital cost to convey drinking water ½ mile compared to Option 1 which may require a pump station to pipe the raw water a distance of slightly more than one (1) mile. Option 2, if deemed feasible, could also be executed at significantly lower costs to operate and maintain than Option 3 because groundwater treatment would potentially not be required. In fact, the O&M identified for Option 2 is considered optional as it is reasonable to assume that the Water District was already required to perform periodic rehabilitation and maintenance of their existing PWS treatment system. The primary disadvantage of this option remains uncertainty given our limited knowledge of existing conditions although there is less risk when compared to Options 1 and 3. This option is currently recommended as the best target by C.T. Male given the lack of groundwater quantity and quality information in the vicinity of the Water District.

<b>OPTION 2</b>		
<b>Bedrock Potable Water Wells North of Town Park and West of Albany Hill Road</b>		
<b>Tax Parcel I.D. #: 137.9-2-10, Lands Owned by Edmund Niles Huyck Preserve</b>		
<b>Feasibility Criterion</b>	<b>Scoring (_ of 3)</b>	<b>Advantages/Disadvantages</b>
Compliance	2	Sampling of each cased replacement water supply well will be tested for NYSDOH Part V parameters. This method assumes no treatment for PFAS or removal of other nuisance parameters, besides chlorination, will be required to mitigate the subject bedrock groundwater source. It is possible that Option 2 could comply with Standards, Criteria, and Guidelines (SCGs).
Protection of Human Health & the Environment	2	The bedrock wells at this location could be affected by movement of unknown contaminants in the consolidated aquifer over time but is less likely than compared to Option 3.

<p>Long-term effectiveness and permanence</p>	<p>2</p>	<p>Option 2 would require at least two (2) test wells to fulfill production wells for redundancy. Each new bedrock groundwater supply source(s) would be proven to not require additional pretreatment, based on site characterization, aquifer testing, and monitoring. The primary disadvantage of this option remains uncertainty given our limited knowledge of existing conditions although there is less risk when compared to Options 1 (drought sensitivity) and 3 (additional depth required and may require significant pretreatment). C.T. Male is unable to predict the groundwater chemistry over time without collecting additional aquifer testing information.</p>
<p>Reducing toxicity, mobility, and volume</p>	<p>3</p>	<p>This option is designed to provide drinking water from bedrock groundwater resources within lands owned by the Preserve at an optimal location based on our assessment of the bedrock geology and the potential recharge from an overlying principal unconsolidated aquifer.</p>
<p>Short-term effectiveness</p>	<p>2</p>	<p>Option 2 would require the conversion of the test wells to production wells and the construction of a gravity fed water main to connect to the Water District's distribution system. Option 2 would require land disturbance to enable driller access for the subject groundwater exploration and for the connection to the existing water transmission main. Construction would have minor short-term impacts to the community, such as noise. Stormwater pollution during construction would be mitigated using standard erosion and sediment controls. For this option to be implemented, the Town and Water District would also need to commit to a phased approach and maintain the existing PWS while the bedrock aquifer evaluation is being executed.</p>
<p>Implementability</p>	<p>3</p>	<p>Option 2 would convert onsite test wells to production wells as a replacement source of water for the Water District and its users. Option 2, like Option 1, would require approvals from the Huyck Preserve, NYSDEC, Albany County DOH, and NYSDOH. The technical feasibility of this option is known and involves standard protocols to install well pump components, conduct pumping tests, aquifer and drinking water analysis, and installation to connect to the existing distribution system.</p>
<p>Cost</p>	<p>3</p>	<p>For the purpose of direct comparison, Option 2 has the second highest estimated capital cost (\$30,000 per well). Options 2 and 1 have the lowest future costs as no groundwater treatment would likely be required. The future O&amp;M costs for this option are considered optional as previously described.</p>

**TOTAL: 17**

#### **4.3 Source Water Analysis - Option 3 (Bedrock Aquifer, North of Rensselaerville Volunteer Fire Company, Inc., (4990 Delaware Turnpike))**

This option involves the drilling/installation/sampling/testing/permitting of bedrock water supply wells on the parcel north of the Town's Volunteer Fire Department on Delaware Turnpike. This option would also only serve the existing Water District users. C.T. Male reviewed the possibility of connecting to the existing small-scale distribution system supplied by a new water supply source via drilled bedrock potable water wells on lands owned by a private resident (Peter Kessler, Tax Parcel I.D. #: 137.-1-3) that are higher in elevation than and within ½ mile of the existing distribution system. Based on review, the depth to bedrock (Lower Differentiated Hamilton Group) is likely between 25 to 50 feet below grade that may be partially overlain by transmissive glacial outwash sand and gravel deposits. C.T. Male recommends drilling at this target area for high yield, cased water wells because Option 3 lands are located in relative close proximity to the existing distribution system at a location of the intersection of mapped photolinears where nearly vertical joints may intersect with a fracture trace within the Tenmile Creek valley. To optimize water quantity and quality, it is suggested that the subject groundwater exploration within Option 3 be limited to be 500 feet below grade or less. According to our records, the closest water well of record (Well ID # A00147, Carey Institute for Greater Good) yields 12 gpm and is 515 deep. Depth, pump specifications, and other factors can be controlled when installing/testing each prospective water supply well. For purposes of this analysis, it is assumed two (2) supply wells will be installed to fulfill the demands of the Water District and NYSDOH and NYSDEC source water requirements.

Each cased PWS test well will be drilled, developed, and sampled to compare to NYSDOH Part V criterion and assess if sufficient water quantity can be attained. Preliminary site characterization of each target test well would be required and will include groundwater sampling within the key water bearing zone within the open hole rock column. The objective of this exploratory investigation is similar to as described for Option 2. If the site characterization does not identify the presence of poor water quality in bedrock groundwater, a step test program and 72-hour constant rate pumping test will be performed to confirm that the subject well can achieve the Water District's water quantity demands. If the pumping test is successful and meets the stated goals an additional groundwater sample will be collected at the end of each constant rate pumping test.

If subject bedrock groundwater quality indicates no significant treatment is required (e.g., chlorides, hydrogen sulfide, total dissolved solids, specific conductance, iron, and manganese) and sufficient water quantity can be attained, each bedrock test well can be connected to the existing distribution system for the Water District once an Engineering Report and associated public drinking water permitting documents have been submitted

to and approved by the Albany County Department of Health, New York State Department of Health, and New York State Department of Environmental Conservation. Once the connections have been completed and demonstrate to be in compliance with State and Federal drinking water standards and guidelines the existing treatment building will be decommissioned in accordance with NYS procedures.

If selected, this option would delay implementation of a long-term solution until after the new bedrock water supply well(s) demonstrate that the alternative water supply source can safely provide the available capacity and sufficient water quality to meet the Water District's requirements. For this option to be implemented, the Town and Water District would have to commit to a phased approach and keep operations of the existing PWS system in compliance until the site characterization and bedrock aquifer evaluation is being performed at this location.

The estimated initial capital cost and optional yearly O&M cost is \$2.0 million and \$10,000, respectively. The total cost for Option 3 would be the highest and assumes distribution system design, easements, well rehabilitation, and construction will be no different than what C.T. Male has encountered for other PWS systems that have bedrock groundwater as its source. C.T. Male further assumes that each bedrock well will be of similar depth to private water wells drilled in the surrounding area (less than 500 feet below grade) and the location(s) will be accessible by a truck-mounted drill rig and water treatment does have the potential to be required if deeper bedrock formations are encountered. This cost estimate does not include possibility of treatment, environmental permitting or an increase in the Water District's water main diameter.

An advantage of Option 3 is the lower capital cost to convey drinking water  $\frac{1}{2}$  mile compared to Option 1 which may require a pump station to pipe the raw water a distance of slightly more than one (1) mile. Option 3, if deemed feasible, could also be executed at significantly lower costs to operate and maintain than other targets in the vicinity, such as the Shoefelt Corners area, because groundwater treatment may not be required and the shorter distance to the existing distribution main. The primary disadvantage of this option remains uncertainty given our limited knowledge of existing conditions although there is less risk when compared to Option 1. This option is currently recommended as the second best target by C.T. Male given the lack of groundwater quantity and quality information in the vicinity of the Water District.

<b>OPTION 3</b> <b>Bedrock Potable Water Wells North of Town Park and West of Albany Hill Road</b> <b>Tax Parcel I.D. #: 137.-1-3, Private Lands Owned by Peter Kessler</b>		
Feasibility Criterion	Scoring (_ of 3)	Advantages/Disadvantages
Compliance	2	Sampling of each cased bedrock water supply well will be tested for NYSDOH Part V parameters. This method assumes no treatment for PFAS or removal of other nuisance parameters, besides chlorination, will be required to mitigate the subject bedrock groundwater source. It is possible that Option 3 could comply with SCGs but is not as certain as Options 1 or 2.
Protection of Human Health & the Environment	1	The bedrock wells at this location could be affected by movement of unknown contaminants in the consolidated aquifer over time and is more likely when compared to Options 1 and 2.
Long-term effectiveness and permanence	2	Option 3 would require at least two (2) test wells to fulfill production wells for redundancy. Each new bedrock groundwater supply source(s) would be proven to not require additional pretreatment, based on site characterization, aquifer testing, and monitoring. The primary disadvantage of this option remains uncertainty given our limited knowledge of existing conditions although there is less risk when compared to Option 1 (drought sensitivity). C.T. Male is unable to predict the groundwater chemistry over time without collecting additional aquifer testing information.
Reducing toxicity, mobility, and volume	2	This option is designed to provide drinking water from bedrock groundwater resources within lands owned by a private resident at an optimal location based on our assessment of the bedrock geology and the potential recharge from overlying outwash deposits.
Short-term effectiveness	2	Option 3 would require the conversion of the test wells to production wells and the construction of a gravity fed water main to connect to the Water District's distribution system. Option 3 would require land disturbance to enable driller access for the subject groundwater exploration and for the connection to the existing water transmission main. Construction would have minor short-term impacts to the community, such as noise. Stormwater pollution during construction would be mitigated using standard erosion and sediment controls. For this option to be implemented, the Town and Water District would also need to commit to a phased approach and maintain the existing PWS while the bedrock aquifer evaluation is being executed.
Implementability	2	Option 3 would require access from a private landowner, converting onsite test wells to production wells as a

		<p>replacement source of water for the Water District and its users. Option 3, like Options 1 and 2, would require approvals from the NYSDEC, Albany County DOH, and NYSDOH. The technical feasibility of this option is known and involves standard protocols to install well pump components, conduct pumping tests, aquifer and drinking water analysis, and installation to connect to the existing distribution system.</p>
Cost	2	<p>For the purpose of direct comparison, Option 3 has the highest estimated capital cost (\$30,000 per well). Options 3 and 2 have the lowest future costs as no groundwater treatment would likely be required. The future O&amp;M costs for this option are considered optional as previously described.</p>

**TOTAL: 13**

## REFERENCES

Arnow, Theodore, 1949, The Ground-Water Resources of Albany County, prepared by the U.S. Geological Survey in cooperation with the State of New York Department of Conservation Water Power & Control Commission, Bulletin GW-20, 56 p. [2 plates].

Bugliosi, E., R. Trudell, and G. Casey, 1987, Potential Yield of Unconsolidated Aquifers in Upstate New York - Hudson-Mohawk Sheet, Water-Resources Investigations Report 87-4275, prepared by USGS in cooperation with the New York State Department of Environmental Conservation.

Cadwell, D.H., and Robert J. Dineen, 1987, Surficial Geology of New York - Hudson-Mohawk Sheet; New York State Museum Map and Chart Series 40, scale 1:250,000.

Clough Harbour and Associates, July 19, 1993, Interim Report – Town of Rensselaerville, Rensselaerville Water District No. 1.

Clough, Harbour and Associates, April 1995, "Report to the Town of Rensselaerville on Water Supply Development and Treatment Alternatives for the Rensselaerville Water District No. 1".

Community Planning & Environmental Associates, The Laberge Group, March 8, 2007, FINAL Town of Rensselaerville Comprehensive Plan, prepared for the Town of Rensselaerville.

Cook, J.H., 1930, Glacial Geology of the Capital District, New York State Museum Bulletin 285.

Cadwell, DH, E.H. Muller, P.J. Fleischer, 2003, Geoarchaeology of Landscapes in the Glaciated Northeast, New York State Museum Bulletin 497.

Fishman, Elliott, P.E. (Santo Associates, PC), February 8, 1996, Letter to Town Board RE: Proposed Water Supply Investigation (Hamlet of Rensselaerville).

Gowan, Samuel W., Ph.D., CPG, (Alpha Geoscience), Fishman, Elliott, P.E. (Santo Associates, PC), February 8, 1996, Letter to Town Board RE: Proposed Water Supply Investigation (Hamlet of Rensselaerville).

*Isachsen, Y.W., and W. McKendree, 1977, Preliminary Brittle Structures Map of New York: Hudson-Mohawk sheet; map scale: 1:250,000.*

Kantrowitz, I.H. & D.S. Snavely, 1982, Availability of ground-water from aquifers in upstate New York, USGS open-file report 82-437, 2 sheets (Plate 1: Unconsolidated; Plate 2: Bedrock Aquifers).

Cornell Cooperative Extension of Columbia and Greene Counties, December 2020, "The Catskill Creek Watershed", prepared with funding from the New York State Environmental Protection Fund through the DEC Hudson River Estuary Program.

New York Rural Water Association, 2007, Groundwater Report (Appendix D) for FINAL Town of Rensselaerville Comprehensive Plan, prepared for the Town of Rensselaerville, pages 259 - 290.

New York State Department of Health, Water Well Records (2 Miles from Lake Myosotis).

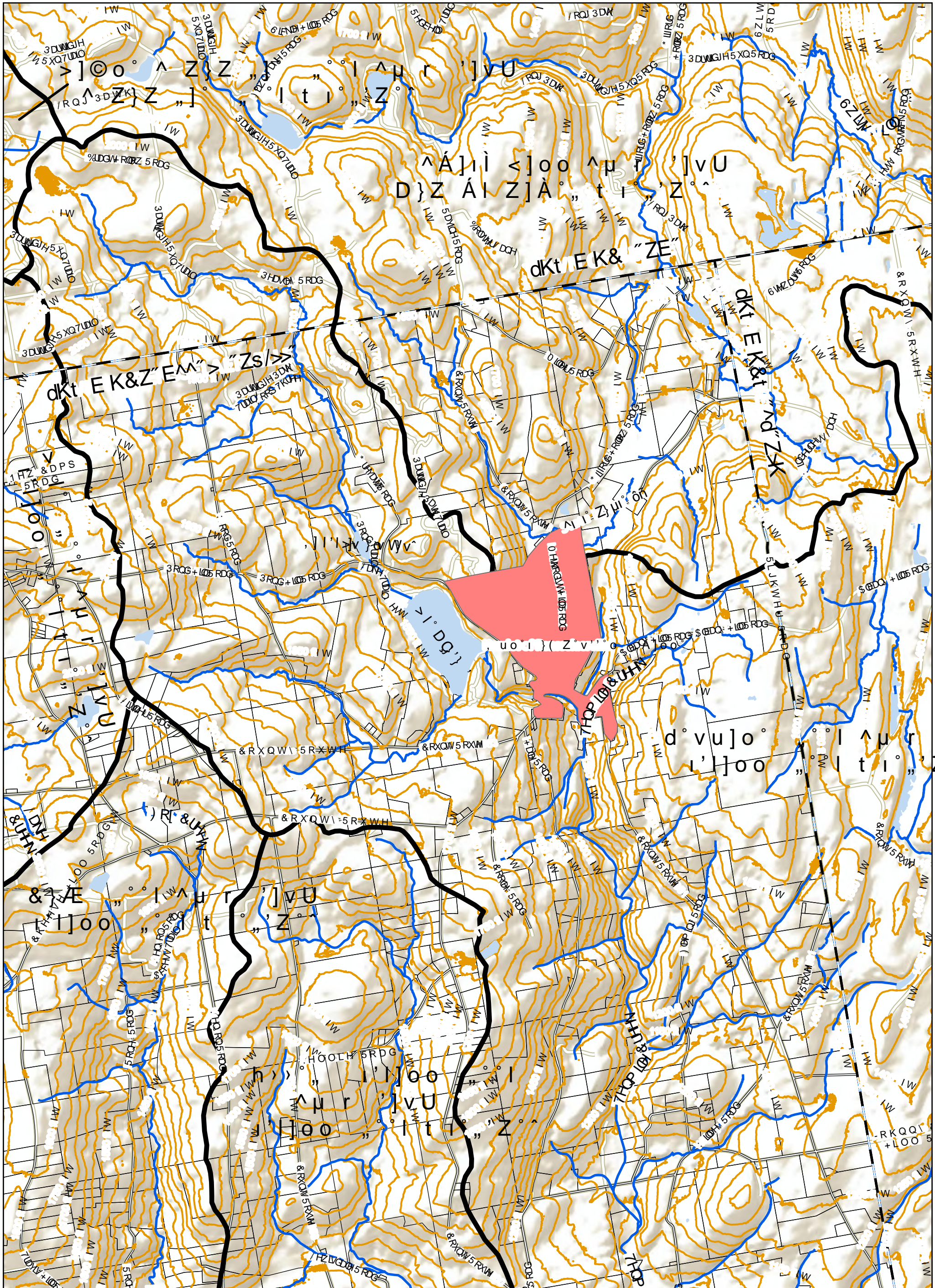
Randall, Allan D., May 11/30, 1995, Potential Development of Groundwater Supply Source for Hamlet of Rensselaerville, New York, prepared for Lisa Mulleneaux.

Rickard, L.V., Isachsen, Y.W., and Fisher, D.W., Geologic Map of New York - Hudson Mohawk Sheet, 1: New York State Museum, Map and Chart Series 15, scale 1:1,970.

Siegfried, Clifford A., "The Phytoplankton of Lake Myosotis: Limiting Nutrients and Community Dynamics", Biological Survey, New York State Museum and Science Service.

Town of Rensselaerville Water District, 2022, Annual Drinking Water Quality Report for 2022- Rensselaerville Water District (Public Water Supply ID# NY0100202).

## **FIGURES**



**e**

<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: red; border: 1px solid black; margin-right: 5px;"></span> , uo' i } ( Z' v' ' ' o " , A } oo</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: blue; border: 1px solid black; margin-right: 5px;"></span> , uo' i } ( Z' v' ' ' o " , A } oo</li> <li><span style="display: inline-block; width: 15px; height: 15px; border-bottom: 2px solid black; margin-right: 5px;"></span> t i " , ' Z " " } μ v " , Ç</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: lightblue; border: 1px solid black; margin-right: 5px;"></span> &gt; l' i W } v "</li> </ul>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> d } A v } ( Z' v' ' ' o " , A } oo</li> <li><span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> d } A v } μ v " , Ç</li> <li><span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> A i " , " i' i Z } "</li> </ul>
---	---

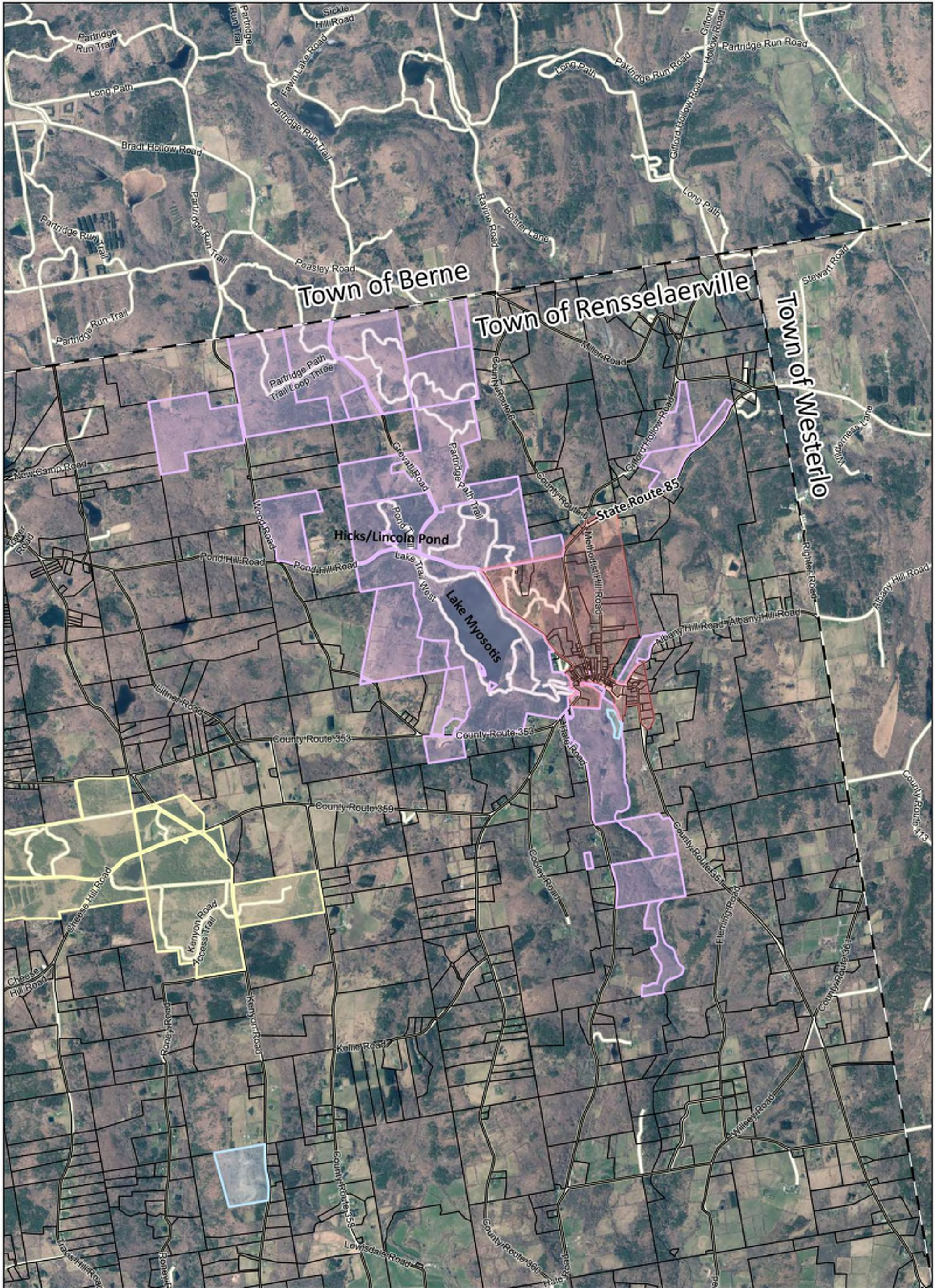
3URMHFW 1XPEHU.  
 'DWD 6RXUFH, 1<6", 6 &OHDULQJKRXVH  
 3URMHFWLRQ, :\*6  
 'DWH, -DQXDUI  
 )LOH, /DNH 0'RVRWLV DSU[  
 , 6, & %RQGL

0LOHV  
 LQ ~ 0LOHVQ ~ )HHW

& ] P μ " , ' i

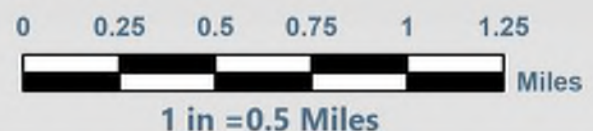
5HQVVHODHUYLOOH 7RSRJUDSKV  
 7RZQ RI 5HQVVHODHUYLOOH \$OEDQI &RXQW

**C.T. MALE ASSOCIATES**  
 Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
 50 CENTURY HILL DRIVE, LATHAM, NY 12110  
 518.786.7400 • FAX 518.786.7299



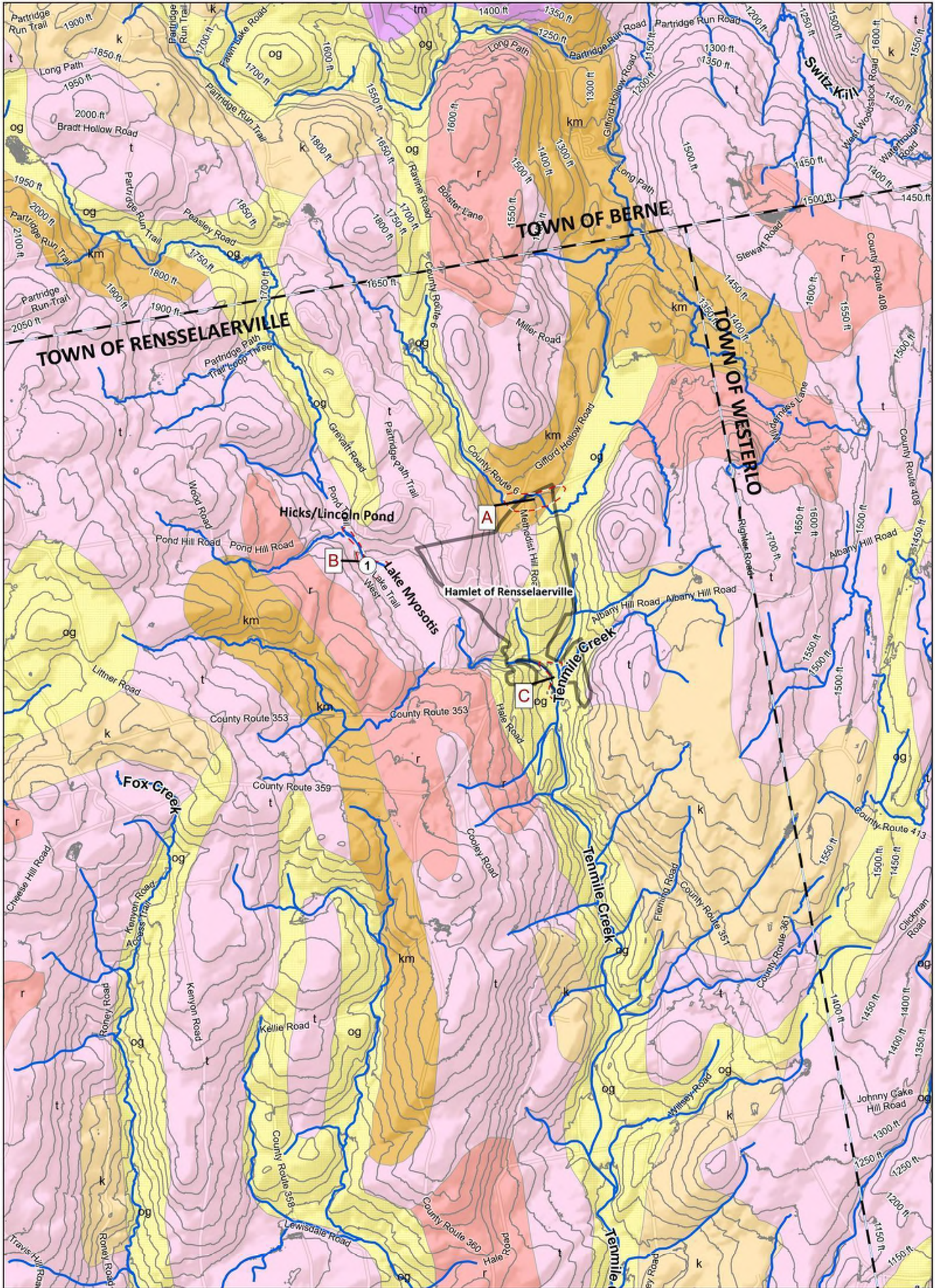
- Legend**
- Hamlet of Rensselaerville
  - State Owned Lands
  - Huyck Preserve Owned Lands
  - Town Owned Lands
  - Other Owned Lands
  - Streets/Roads
  - Town Boundary

Project Number: 24.4005  
 Data Source: NYSGIS Clearinghouse  
 Projection: WGS 84  
 Date: January 25, 2024  
 File: Lake Myosotis.aprx  
 GIS: C Bondi



**Figure 2**  
 Rensselaerville Public & Privately Owned Lands  
 Town of Rensselaerville Albany County, NY

**C.T. MALE ASSOCIATES**  
 Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
 50 CENTURY HILL DRIVE, LATHAM, NY 12110  
 518.786.7400 \* FAX 518.786.7299



**Legend**

- Potential Unconsolidated Aquifer Area (A. Randall, 1995)
- Groundwater Target Area (C.T. Male, 2024)
- Hamlet of Rensselaerville
- Surface Elevation Contours (50ft)
- og - Outwash Sand & Gravel
- k - Kame Deposits
- km - Kame Moraine
- tm - Till Moraine
- t - Till
- r - Bedrock
- Town Boundary
- Streets/Roads
- Stream/River

0 0.25 0.5 1 1.5 2 Miles

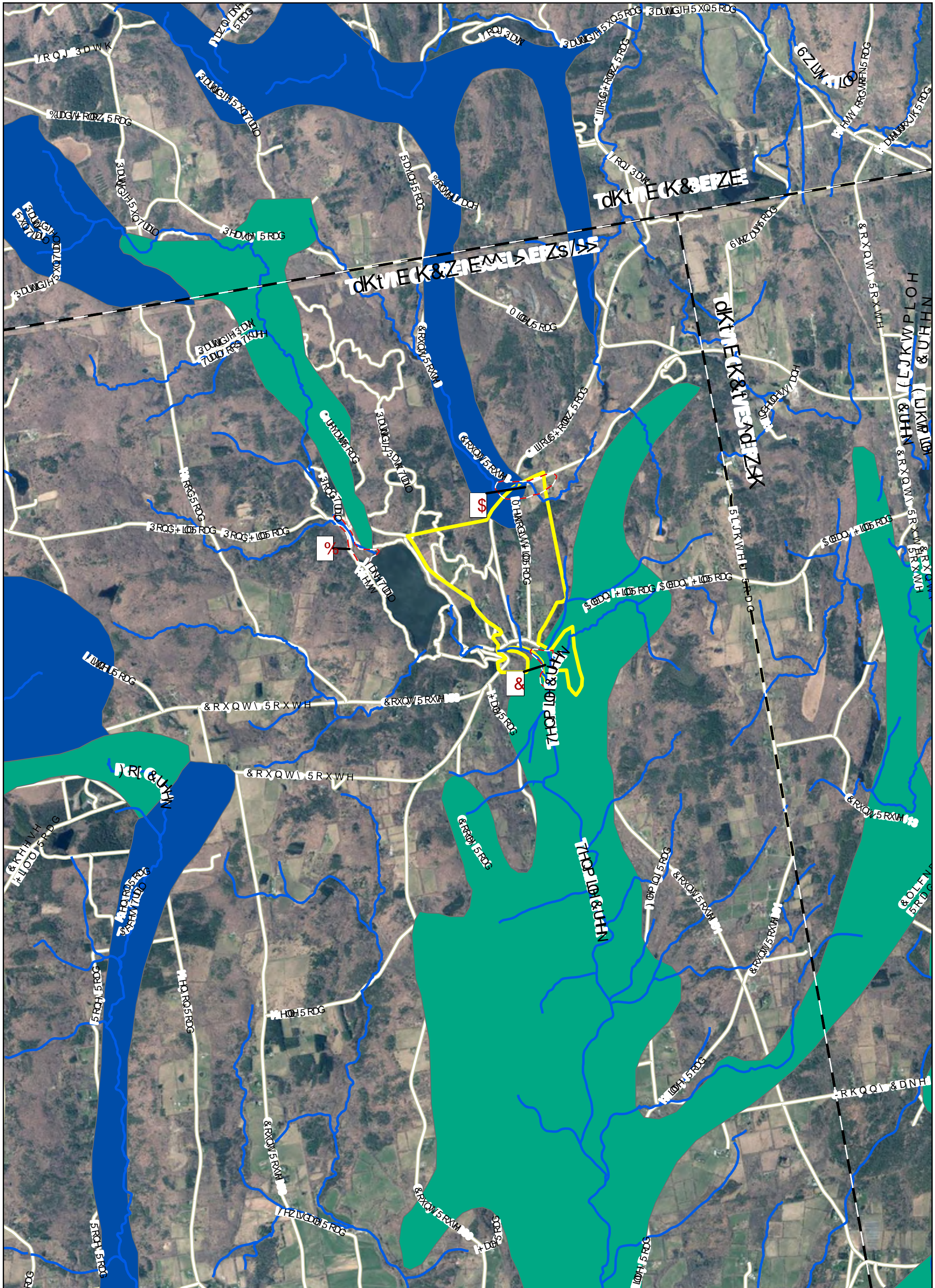
1 in = 0.5 Miles      1 in = 2,640 Feet

**Figure 3A**  
Rensselaerville Surficial Geology

Town of Rensselaerville      Albany County, NY

**C.T. MALE ASSOCIATES**  
Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
50 CENTURY HILL DRIVE, LATHAM, NY 12110  
518.786.7400 \* FAX 518.786.7299

Project Number: 24.4005  
Data Source: NYSGIS Clearinghouse  
Surficial Geologic Map of New York  
Hudson-Mohawk Sheel by D. Cadwell & R. Dineen, 1987  
Projection: WGS 84  
Date: January 25, 2024  
File: Lake Myosotis.aprx  
GIS: C Bondi



> P v

3URMHFW 1XPEHU  
 'DWD 6RXUFH 1<6\*.6 & OHDULQJRXVH  
 3RWHQWLDQ <LHOG RI 8QFRQVROLGDWHG \$TXLIHUV LQ 8SVWDWH 1HZ <RUN  
 +XGVRQ ORKDNZ 6KHHW E\ ( %XJLRVL 5 7UXGHOO  
 DQG \* &DVH\  
 3URMHFWLRQ :\*6  
 'DWH -DQXDU\  
 )LOH /DNH 0RVRWLVS DSU\  
 :.6 & %RQGL

0LOHV  
LQ 0LOHV

& ]P μœ ï

5HQVVHODHUYLOOH 8QFRQILQH

7RZQ RI 5HQVVHODHUYLOOH \$OEDQ\ &RXQW

**C.T. MALE ASSOCIATES**  
 Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
 50 CENTURY HILL DRIVE, LATHAM, NY 12110  
 518.786.7400 \* FAX 518.786.7299



- Legend**
- Groundwater Target Area (C.T. Male, 2024)
  - Dhmo - Hamilton Group, Moscow Formation
  - Dhpl - Hamilton Group, Plattenkill Formation
  - Dhm - Undifferentiated Lower Hamilton Group
  - Hamlet of Rensselaerville
  - Stream/River
  - Streets/Roads
  - Town Boundary
  - Fracture Trace (Alpha Geoscience, 1995)
  - Lineament (Randall, 1995)
  - New York State Brittle Structures



Project Number: 24.005  
 Data Source: NYSGIS Clearinghouse  
 Geologic Map of New York, Hudson-Mohawk Sheet  
 by LV Rickard & DW Fisher, 1970/1995  
 Preliminary Brittle Structures of New York State  
 Hudson-Mohawk Sheet by I. Isachsen & WG McKendree, 1977  
 Projection: WGS 84  
 Date: January 25, 2024  
 File: Lake Myosotis.aprx  
 GIS: C Bondi

**Figure 4**  
 Rensselaerville Bedrock Geology

**Town of Rensselaerville** **Albany County, NY**

**C.T. MALE ASSOCIATES**  
 Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
 50 CENTURY HILL DRIVE, LATHAM, NY 12110  
 518.786.7400 \* FAX 518.786.7299

## **APPENDICES**

May 11, 1995

To: Doug Ferguson, N.Y. Department of Health  
Lisa Mulleneaux, Rensselaerville

From: Allan Randall, hydrogeologist  
P.O. Box 258, Sand Lake, N.Y. 12153

I have been asked to appraise the potential for development of a municipal water supply from ground water to serve the hamlet of Rensselaerville, which I am told contains about 70 residences. After reviewing geologic and soils maps available in the U.S. Geological Survey library, I believe that the possibility of developing a small municipal supply from sand or gravel deposits within a mile of the hamlet is real enough to justify a site investigation.

The most promising locality is just east of Shoefelt Corners, about a mile north of Rensselaerville. (A on enclosed map). When the continental ice sheets were melting and retreating from the area that now comprises the town of Rensselaerville, meltwater apparently flowed down a tributary valley toward Shoefelt Corners from the northwest, and also southward along the side of a valley northeast of Shoefelt Corners that now drains northward. A temporary lake developed near and north of Shoefelt Corners, ponded between the ice and saddles a half-mile north of the hamlet. The soils map indicates surficial gravel (a delta or fan) around Shoefelt Corners, and very fine sand (Raynham soil) on the valley floor to the east. I suspect that close to Shoefelt Corners the gravel may be so thinly saturated as to preclude conventional wells, but it may thicken or deepen several hundred feet further east. A well 1/3 mile northeast of Shoefelt Corners along Route 85 reportedly reached bedrock at 94 feet. If thick saturated sand and gravels are not present, a shallow infiltration gallery (a ditch backfilled with a perforated pipe and coarse sand or fine gravel) in the fine sand deposits on the valley floor could probably provide an adequate yield.

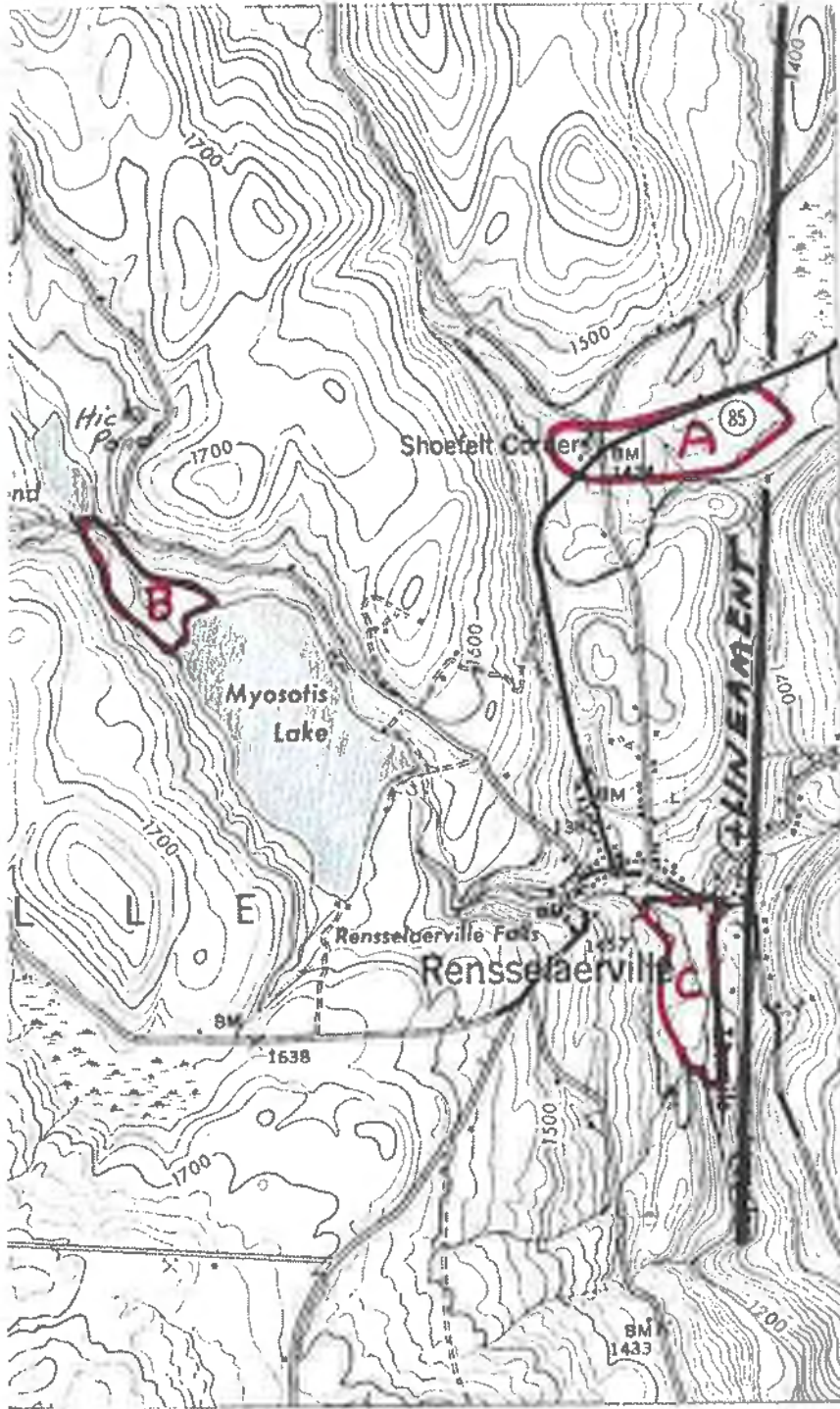
Saturated gravel may also be present beneath the valley floor between Hicks Pond and Myosotis Lake, about a mile northeast of Rensselaerville hamlet (B on the map) and along the floor of Tenmile Creek valley 100 to 2000 feet south (downstream) from the hamlet (C on the map) Alluvial gravel at these locations is likely to be on the order of 10 feet thick and could be tapped only by infiltration galleries, if at all. Any infiltration gallery could be expected to derive water in part from the nearby creek, filtered through the alluvial sediments. Therefore, the chemical quality of the creek water would be a

consideration.

It may also be possible to obtain the amount of water needed from bedrock. Prior to 1949, the U.S. Geological Survey inventoried 12 wells that tap the bedrock unit (Hamilton Group) that underlies Rensselaerville. Average and maximum reported yields were 7.5 and 16 gallons per minute. Accordingly, chances are that one well could not produce enough water from bedrock for a municipal supply; if so, the possibility of pumping from 3 or 4 wells of lesser yield spaced a few hundred feet apart is worth considering. Some hydrogeologic studies have reported that wells drilled along major lineaments tend to yield more water than wells drilled elsewhere. One such lineament is defined by the north-south reach of Tenmile Creek and other valleys just east of Rensselaerville, as marked on the enclosed map. Other consultants with practical experience in fracture-trace analysis may be able to provide more advice in the regard.

I would not expect to be paid for preparing this memorandum nor for briefly visiting Rensselaerville and talking with people (if this be desired) on May 16th, other than reimbursement of expenses. If you wish me to investigate localities A - C mentioned above as potential sites for wells or infiltration galleries, I would charge \$25 per hour, plus expenses such as for travel. The first step would be to walk the stream reaches and environs to check for exposures of till or bedrock that would limit or eliminate the potential for a sand or gravel aquifer, and to gather information about any nearby wells. This would probably take a day or two. The logical next steps would be to contract for power auger test holes (in the Shoefelt Corners area) and/or backhoe pits, possibly followed by exploration with electromagnetic or seismic equipment.

*Allan Randall*



(M)

POTENTIAL FOR MUNICIPAL WATER SUPPLY  
FROM GROUND WATER FOR RENSSELAERVILLE, N.Y.  
by Allan D. Randall, May 1995

Shoefelt Corners Area

The chances are very good that enough water to supply Rensselaerville could be obtained from a drilled well 25 to 70 feet deep, penetrating sand or gravel, east or southeast of Shoefelt Corners. A map (fig. 1) shows the extent of surficial sand and gravel in this area based on the county soils map and confirmed in a few places by personal observations. Two units are shown: ice-contact stratified drift which underlies various knolls and terraces, and valley-floor alluvium, which overlaps the ice-contact deposits and may overlies fine-grained lake sediments and/or peat in places. Also shown is the approximate altitude of the bedrock surface at 2 outcrops and 3 boreholes. The map is provisional; I may be able to refine it later.

Geologic history. The ice-contact stratified drift was deposited amid decaying ice along the margin of the retreating ice sheet, in ponds that overflowed southward across saddles between the hills when ice still blocked the preglacial northward or eastward drainage routes. The earliest ice-contact stratified deposits reach altitudes of 1460 feet and probably were deposited by meltwater that drained across the saddle at 1460 feet along Route 85 southwest of Shoefelt Corners. Gravel deposits high on the valley side about a mile north of Shoefelt Corners reach an altitude of 1475 feet and were probably part of the same meltwater flow system. When the ice melted enough to allow southward flow across a saddle at 1390 feet into the valley that drains past the playground at Rensselaerville, the lake level near Shoefelt Corners dropped to 1390 feet and remained there until lower outlets further north were exposed and drainage assumed its present course.

Geohydrology. Ice-contact stratified drift exposed near Shoefelt Corners includes layers of coarse sand and gravel that would be excellent aquifers if saturated, but is quite heterogeneous, varying widely in grain size and permeability over distances of only a few feet. Unfortunately, bedrock lies at shallow depth at Shoefelt Corners, as indicated by ledges exposed in the stream at the bridge and by the water table only a foot below land surface in a deep well at Mike Fritz's body shop; if the surficial sand were several tens of feet thick the water table would be much lower. Depth to bedrock increases east of Methodist Hill Road, however, as indicated by two recent test borings by the N.Y. Dept. of Transportation along Rt.

85, and by the record of a well at the former residence of George Hale, published by the U.S. Geological Survey (Arnow, 1949). Fleisher (1986) interpreted the valley floor east of Methodist Hill Rd. as a lake plain, underlain by silt and clay, a condition typical of many flat valley bottoms in New York. Two bits of evidence indicate, however, that much of the sediment beneath the valley bottom is sand and gravel, deposited during the earlier ice-contact phase of deposition.

1. Test boring DNB4, 2300 feet east of Shoefelt Corners along Rt. 85, penetrated sandy gravels and silty sands from 15 to 45 feet, with till and/or broken rock below. Whether the sands and gravels at this location are clean enough to yield much water is not clear, but in any case these materials are not fine-grained non-aquifer lake-bottom sediments.
2. Three aligned gravel-capped low ridges or elongated knolls rise 10 to 15 feet above the valley floor. They are not defined by contour lines on the topographic map, but are readily visible in the field, and fall on a gently curved alignment from northeast to west (fig. 1). I believe they reflect the position of a tunnel or crevasse in the ice that carried meltwater flow westward early in the depositional history, before the 1390-foot saddle became an outlet for meltwater. Coarse sand and gravel could be expected to occur along such a meltwater channel.

Exploration. If the Water Board chooses to seek a water supply from the sand and gravel aquifers in the Shoefelt Corners area, a logical next step would be to drill one or more test wells southeast of Shoefelt Corners, using a cable-tool drilling rig and 6-inch diameter casing. If several feet of water-yielding sand or gravel are penetrated, such a test well could be made into a production well by installing a well screen (or possibly by developing it open-ended in coarse gravel). The driller should have a sand pump available for collecting samples of loose, water-bearing sediments and should expect to advance casing in 2 or 3-foot increments when penetrating possibly water-yielding sediments. A recommended initial site is marked by an X on figure 1. If till or bedrock proves to be shallower than expected at this site, I would select a second site further north and east. Drilling should not be considered until sufficient funds are available for at least one 70-foot well, and ideally for 3 such wells, because experience shows that multiple test holes are commonly required to locate a municipal well in heterogeneous ice-contact deposits.

Water quality. I am aware of two factors that might have an adverse effect on water quality in the Shoefelt Corners area.

1. Swamps. The valley floor is swampy north and south of Rt. 85 about 2000 feet east of Shoefelt Corners; buried organic matter is likely at shallow depth in such areas. The natural flow of ground water in such areas is normally upward and toward the stream; but large pumpage could reverse the natural gradient. Water in contact with sediments that contain organic matter commonly becomes depleted in oxygen and can dissolve enough iron and manganese to constitute a nuisance and require treatment, although it is not a health hazard. Buried organic matter is less likely but possible further west near the sites proposed for test wells.
2. Body shop. The presence of an auto body repair shop at Shoefelt Corners is a matter of concern to Doug Ferguson of the N.Y. Dept. of Health, inasmuch as the solvents and automotive fluids commonly used at such establishments could render ground water unacceptable for municipal use without expensive treatment, if allowed to spill or leak into the ground. The shop appears quite neat, and local residents report the owner to be conscientious and responsible. Nevertheless, the shop is upgradient from the most promising sites proposed for test drilling. Therefore, if the potential for a municipal well is confirmed by test drilling, prudence would dictate that tests to verify the absence of organic contaminants be undertaken not only on water pumped from the well but also a short distance east of the body shop. There are many consulting firms who specialize in monitoring and remediation of organic contaminants and could recommend an appropriate assessment.

Long-term considerations. The Shoefelt Corners area is probably the only locality within a mile or two of Rensselaerville that has a predictable potential for large capacity wells. Well yields of a few hundred gallons per minute and a total average withdrawal of a few hundred thousand gallons per day seem possible here. Whether or not this locality is selected for exploration for a municipal water supply now, the town may wish to consider the potential for large municipal or industrial withdrawals in its planning and zoning, and may also wish to consider measures to protect the water quality in this potentially valuable resource.

#### Valley Upstream from Myosotis Lake

A set of shallow wells or an infiltration gallery on the valley floor a few hundred feet upstream from Myosotis Lake could probably produce an ample supply of water much better in quality than that currently available from Myosotis Lake, if the gravels beneath the valley floor

are as thick as I suspect they are.

Geology. According to Cadwell and Dineen (1987) gravel and sand occur all along the valley upstream from Myosotis Lake, deposited as outwash by meltwater issuing from an ice margin in the southern part of the town of Berne. Fleisher (1986) also indicates that outwash sand and gravel underlie the valley floor from Myosotis Lake upstream well past Lincoln Pond. Fleisher infers that during deglaciation and in early postglacial time the site of Lake Myosotis was occupied by a natural lake that initially spilled over a thick till deposit at 1555 feet in altitude. Over the centuries the till was incised and lake level declined correspondingly until a dam was constructed in about 1800 that raised the water level to 1540 feet. I observed 3 depositional surfaces in the valley reach between Lincoln Pond and Myosotis Lake as shown on fig. 2:

- a) A terrace at about 1560 feet, along the west side of the valley 200 to 600 feet downstream from Lincoln Pond and immediately downstream from a tributary.
- b) A floodplain, about 5 feet lower than the terrace and itself incised about 6 feet by the stream for about 1000 feet downstream from Lincoln Pond.
- c) A younger, currently active floodplain of slightly gentler slope, beginning about 1000 feet from Lincoln Pond and extending to Myosotis Lake; here the stream divides into several distributary channels that are hardly incised at all and gravel is aggrading (building up).

All these surfaces are underlain by similar coarse gravels containing many slablike cobbles and boulders and other poorly rounded stones. So far as I could tell all these gravels could be classified as alluvium, derived from erosion of till and bedrock by the local streams, perhaps augmented by meltwater in the early stages but containing little or no sediment derived from the ice margin. The terrace (a) might have been graded to the early (1555±) stage; the subsequent floodplain might have been graded to the incised till plug at Rensselaerville; the active, aggrading floodplain (c) is almost certainly the product of post-dam deposition. Moderately steep hillsides underlain by till and bedrock border the valley floor.

Geohydrology. The alluvial gravels in this reach, although containing silt coatings on many stones, are consistently loose and presumably quite permeable. Rick Wyman, of the E.N. Huyck Preserve, reports that the channel between Lincoln Pond and Myosotis Lake is commonly dry in midsummer. On May 23, one distributary channel within the active floodplain had been cut off by sediment accumulation and contained only isolated pools of water that represented the water table, while a parallel channel 50 feet away contained abundant flow at an estimated 1.5 feet higher.

level. These observations suggest that the alluvial gravel is thick and permeable enough to transmit modest amounts of runoff as underflow, allowing the stream to go dry at times, and that as the valley floor widens downstream the amount of underflow increases, so the stream loses water by seepage into its bed. It seems reasonable to expect the saturated thickness of alluvial gravel to be about 10 feet near the upstream end of the active floodplain, where older alluvium (observed to be more than 6 feet thick further upstream) is inundated by younger alluvial gravel. Sand and gravel might be appreciably thicker than 10 feet if some outwash had been deposited by meltwater into an early postglacial predecessor of Myosotis Lake. The alternative hypothesis, of course, is that the valley is essentially a gorge incised in till, with only a few feet of alluvium covering till beneath the valley floor.

Exploration and well development. If the water board wishes to explore further the potential for a municipal water supply from this locality, the logical first step would be to conduct a shallow seismic survey along approximately the line indicated in figure 2. Such a survey should be able to determine the depth to till and/or bedrock beneath the valley floor. If that depth be appreciably less than 10 feet, there would be little reason to consider this locality further. A seismic survey could be conducted with no disturbance of the natural environment in this nature preserve, and would probably be welcomed by management of the preserve as a means of increasing knowledge of their property. Equipment commonly known as a "hammer seismograph", in which sound waves are generated by striking a steel plate with a sledgehammer, would be adequate for the expected depth of investigation. Although no borehole logs are available to calibrate a seismic survey, trial lines could be run at nearby sites known to be underlain by till and by bedrock, to ascertain seismic velocities in these materials. Questions have arisen as to depth to bedrock along the possible route(s) of a pipeline to Rensselaerville from this location; extending the seismic survey to include the proposed route(s) would help answer those questions.

If the results of the seismic survey were promising, the logical next step would be to dig a test pit(s) to a depth of 10 or 12 feet, probably with a backhoe, to verify materials and yield. Depending on what was found and what arrangements had been made with the property owner, the test pit(s) could be filled in, or a well installed immediately. Suggested locations are marked with X on figure 2. It seems to me that the least visually intrusive arrangement for withdrawing water would be a minimum of 2 wells 10 or 12 feet deep and 100 feet or more apart, cased with 2 or 3-foot diameter concrete tiles.

using porous concrete in the lower 6 feet and tightly sealed nonporous concrete above. Damage to trees and other aspects of the natural environment could be limited by careful attention when selecting well sites, access road, and pipeline route. The wells should not require frequent inspection, so an intrusive all-weather road to the site should not be needed. A horizontal infiltration gallery would be equally feasible from a hydrologic viewpoint but would probably be more intrusive during construction.

Shallow wells at many locations are sensitive to natural seasonal fluctuations in depth to the water table. At this location, however, the water board can control the water table by means of the dam on Myosotis Lake; so seasonal fluctuations in saturated thickness should be negligible.

Water quality considerations. The proposed site is, and has long been, a nature preserve, and so is most of the watershed. It is difficult to envision a site anywhere in Albany County with less exposure to manmade pollution. The site is on an active floodplain, so rigorous engineering design to protect the wells from flooding would be required. Proposals to use shallow wells or infiltration galleries near a stream for public water supply are properly subject to close scrutiny by regulatory officials because such installations are likely to be sensitive to water quality in the stream. In this case, however, as pointed out by Doug Ferguson of the N.Y. Health Dept., a pipeline from the wells would surely be laid directly to the present filter plant, and if deemed appropriate the water could be routed through the existing slow sand filter, thereby providing the same protection currently available and vastly longer life for the filter because of the improved quality of the incoming water.

Some organic-rich sediment may occur locally within the alluvium; it is more likely closer to Myosotis Lake than at the proposed test sites. If abundant organic matter were encountered at a test site, I would consider moving upvalley. Oxygenated ground water is continually moving downvalley, so I would not expect small amounts of organic matter to create an iron problem.

#### Wells penetrating bedrock

Chances are slim that one or two wells drilled at random locations could obtain from bedrock the amount of water needed to supply Rensselaerville. Twelve wells drilled prior to 1949 into the bedrock unit (Hamilton Group) that underlies Rensselaerville had average and maximum reported yields of 7.5 and 16 gallons per minute

(Arnow, 1949). In my experience in the Susquehanna River basin to the west, where bedrock may be slightly less productive than here, wells reported to yield about 10 gallons per minute were fairly common, but few bedrock wells yielded 25 to 50 gallons per minute, and many yielded less than 10. Nevertheless, several people have mentioned one or more wells somewhere near Rensselaerville that supposedly yield 20 or 30 or 60 gallons per minute. The two approaches described below should help in selecting a well or well site where the chances of obtaining 25 to 50 gallons per minute from bedrock are better than average:

Inventory wells. By contacting home owners, neighbors, plumbers, well drillers, and the County Health Dept., it should be possible to come up with a listing of owners, locations, yields, and other specifications of wells near Rensselaerville. The next step would be to plot well yields on a map, particularly yields of 20 gallons per minute or more. If one high-yield well is surrounded by other wells not so identified, try to find out whether the others have low yields or not enough information to make the list. Two results might come out of this.

1. Possibly the water board might identify some existing wells that were conveniently and suitably located for public supply and be able to negotiate purchase of the wells, if a rigorous test verified an acceptably large yield. I have no idea if this is a realistic hope.
2. Perhaps a group of high-yield wells would plot along a line or in a locality that could be extrapolated to suggest a site that is convenient, safely positioned with regard to possible contamination sources, and apparently likely to offer above average yield.

I could gather this information but it would take many days and be rather costly, and I expect that members of the water board could do so just as well. If the board wishes to pursue this option I could provide an inventory form and review results. There is no guarantee that it would be successful.

Fracture-trace analysis. Water in bedrock moves almost exclusively through cracks or fractures, also termed joints, in the rock. Some fractures follow the nearly horizontal, gently south-dipping bedding planes that separate successively deposited rock layers; others are at steeply dipping altitudes, oriented as dictated by stresses in the earth over past millennia. Earth scientists have learned that the abundance or spacing of the steeply dipping fractures varies from place to place, and that abundant closely spaced fractures commonly weaken the rock enough that cliffs or valleys develop due to preferential erosion along the fracture zone. Rock that is abundantly fractured should yield water more readily, on the average, than sparsely fractured rock. Accordingly, some

hydrogeologists have looked for linear valleys or other linear features in the landscape that might reasonably be ascribed to fracture zones, and in at least some areas have indeed found above-average yields at such locations.

Two geologists with the New York Geological Survey have looked for linear topographic features visible on topographic maps, or on Landsat, Skylab, or U-2 photo products covering New York, and published their findings (Isachsen and McKendree, 1977). They indicate that the steeply dipping joints in the vicinity of Rensselaerville are nearly vertical (which means that wells drilled with the objective of intersecting a zone of closely spaced joints should be located along the linear topographic feature rather than offset to one side). Their maps show no linear features at or north of the hamlet of Rensselaerville. However, they do identify two linear features somewhat south of Rensselaerville that can readily be projected to coincide with linear features at the hamlet, as shown on figure 3 and described below:

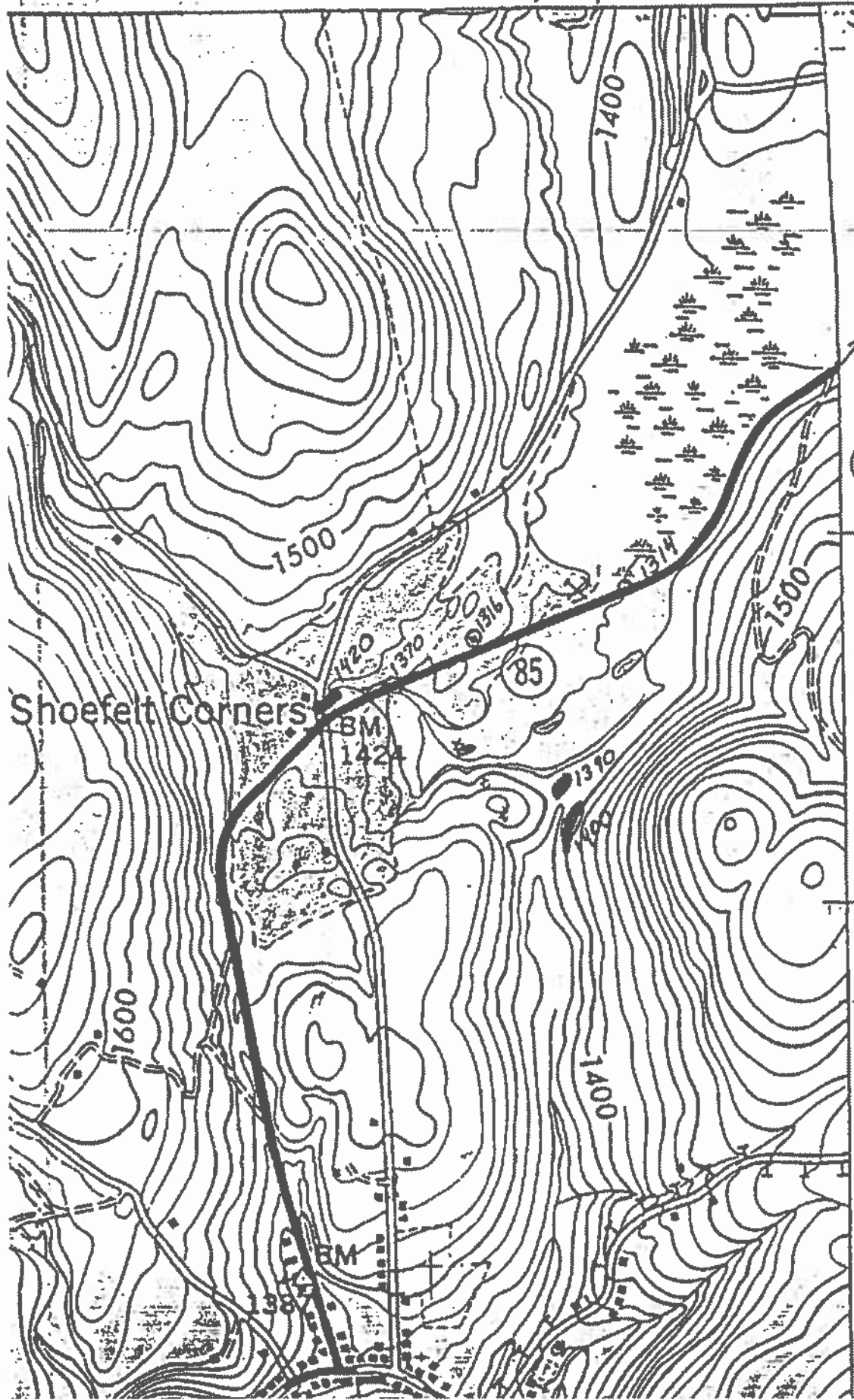
- 1) Follows a linear creek in the Durham 7 1/2 minute quadrangle just south of Rensselaerville and projects north-northeastward to align exactly with the straight southeast shore of Myosotis Lake. Fleisher (1986, p. 7) notes that the straight southeast shore of the lake parallels one set of joints visible in the bedrock at the head of Rensselaerville Falls. (I do not understand why joints in the bedrock should influence the orientation of a lake shoreline along what is identified by Fleisher as a plug of thick glacial till, but the correlation seems too precise to be coincidence.)
- 2) Follows a linear reach of Tenmile Creek in the Durham quadrangle, lies just east of Tenmile Creek in the southern part of the Rensselaerville quadrangle, and projects slightly west of north directly along the linear valley north of the playground at Rensselaerville hamlet. In my memo of May 11, based only on the Rensselaerville quadrangle, I inferred a lineament oriented slightly east of north along this same linear valley and certain other linear features in that quadrangle. Accordingly, if the water board chooses to test the merit of fracture-trace analysis, two drilling sites might be considered. One, along the southeast shore of Myosotis Lake, would probably be conveniently accessible; possible negative aspects of this site are (a) it is high ground (not a valley along a presumed lineament) and (b) the high vertical exposure of bedrock in the falls 1000 feet east may allow some of the water in bedrock to drain out along bedding planes and thus reduce the amount available to wells. A drilling site 1500 feet or more north of the main street in Rensselaerville, near the axis of the aforementioned linear valley, would be less easily accessible but would

be on a linear valley, and would be north of the sidehill cemeteries and septic tanks in the hamlet. I have no basis for estimating the chances of obtaining 25 or 50 gallons per minute from such a well. Other consultants with more practical experience in fracture-trace analysis may be able to provide more advice on this topic, and perhaps identify other lineaments.


It is important to keep in mind that the larger yields reported for some domestic wells penetrating bedrock may be rather imprecise, because the drillers had little incentive to be precise -- yields of 10 gallons per minute or 100 gallons per minute are almost equally good from the viewpoint of the homeowner who does not need even 10 gallons per minute. Also, they are commonly based on tests of at most a few hours duration. Any well penetrating bedrock proposed for use by the Rensselaerville water district should be test pumped for a few days, with arrangements made if feasible to measure water levels in any nearby wells.


FIGURE 1


EXPLANATIO



t till, exposed or augered  
x suggested site for test well

 ice-contact stratified drift

 valley floor alluvium

 till and bedrock, or not mapped

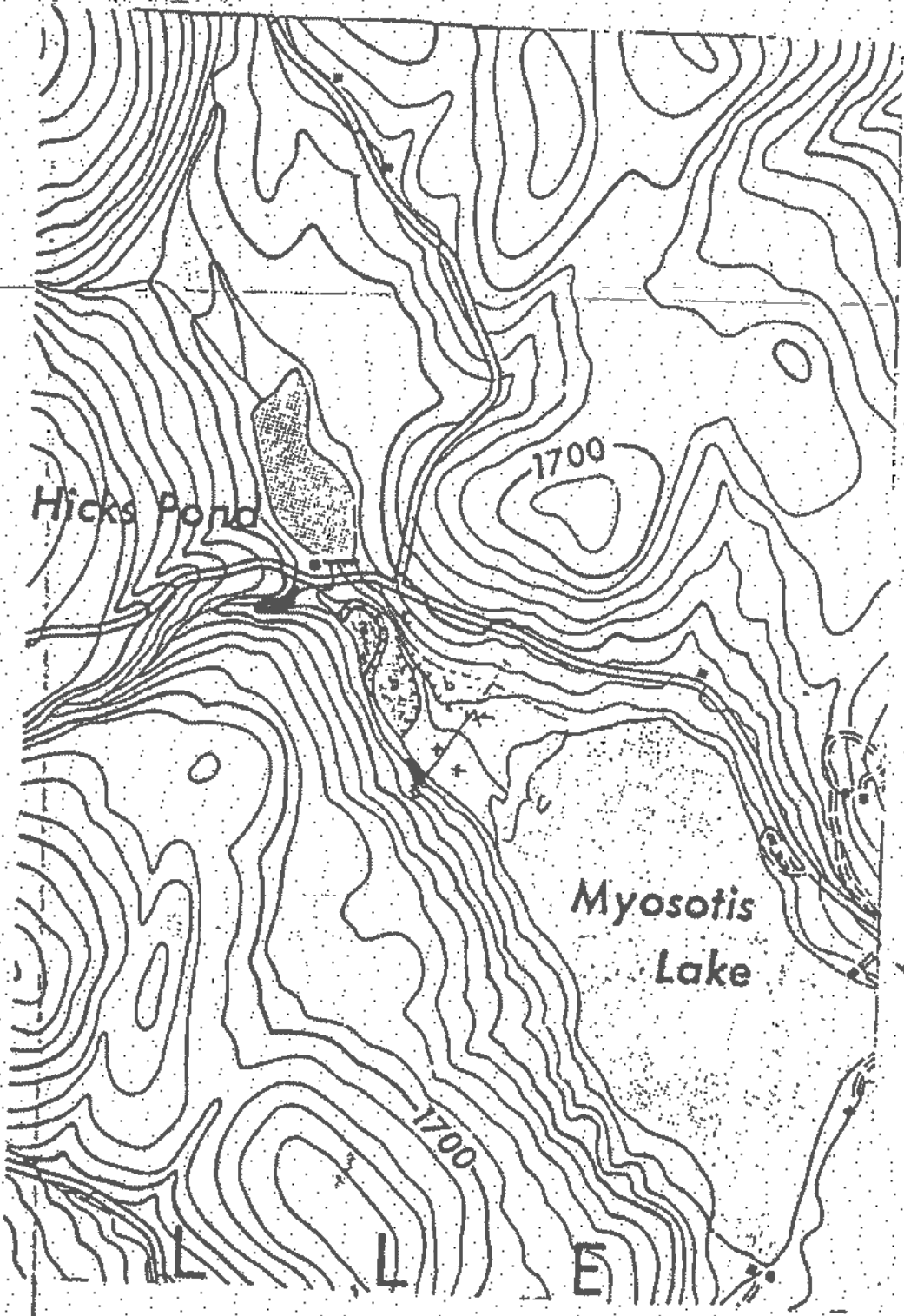
01370 Borehole, and altitude of bedrock surface

1420 Bedrock outcrop, and altitude of bedrock surface

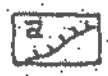





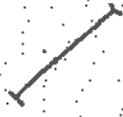

0 500 1000 FEET

Geology modified from Albany County soils map

FIGURE 2



EXPLANATION

-  terrace alluvium or possibly outwash
-  older flood plain alluvium
-  younger active floodplain alluvium
-  till and bedrock, or not mapped
-  till exposure
-  bedrock outcrop
-  suggested seismic survey line
-  suggested site for test pit or well

0 500 1000 FEET

EXPLANATION

Introduction and Scope

The purpose of this explanation is to indicate the scope of the maps, well as the general sources used and the methods of compilation... to identify them as preliminary working documents in a continuing study of the nature and history of brittle deformation in New York State. Earlier work was concerned largely with the extraction and preliminary evaluation of new geological information on Landsat 1 (ERTS) imagery, in a study supported by the National Aeronautics and Space Agency (Isachsen 1973, 1974a; Isachsen and others 1974).

- This publication consists of seven maps as follows:
- four map sheets at 1:250,000 showing faults and related information as well as photo-linear features;
- a composite, desk-size map showing this information at 1:500,000;
- a map at 1:1,000,000 showing joint data generalized by 15-minute quadrangle; and
- an index map keyed to the sources of information used in compiling the above maps.

The maps present all mappable data pertaining to faults, cataclastic zones, and joints that we could glean from the following sources: (1) published and unpublished literature (210 references); (2) our geologic study of Landsat 1 (ERTS), Skylab, and high-altitude photographic products; (3) field checking of selected photographs, and (4) reconnaissance mapping of joints in thirty-nine minute quadrangles. A separate Explanation is given for the accompanying Generalized Map of Recorded Joint Systems in New York State.

Selection of the base map for this compilation involved two requirements: (1) that it be a transverse mercator projection and have a scale of 1:250,000, in order to match the projection and scale of the existing State geologic map (Fisher and others, 1971) and state gravity data (Diment and others, 1973); and (2) that it contain the most accurate representation of drainage available, inasmuch as drainage is such a sensitive response to brittle deformation. The 1974 map of the New York State Department of Transportation fits these requirements well. It was constructed using topographic quadrangles at 1:24,000, except in the Adirondacks where the largest scale available was 1:62,500. All streams were retained in the 50,000 reduction except those shorter than 3 km.

Method of Compilation

The Preliminary Brittle Structures Map was compiled using the following procedures:

- All faults and prominent topographic lineaments shown on the State Geologic map were transcribed onto the new base map.
- The original sources used in compiling the State Geologic Map were searched for additional information pertaining to these structures that could be shown on the present maps. These include such things as dip of fault planes, separation, location and width of faults, and so on, as shown in legend.

The search was extended to the general literature and unpublished theses, maps, reports, and field notes, in order to obtain additional pertinent information.

A preliminary examination was made of bands 8 and 7 of the spectral scanner imagery of Landsat 1 for New York State, dating from the time of launch in July 1972, through March 1974. The resolution of this imagery is 70-80 meters. The most informative of the images were then studied in detail at a scale of 1:500,000, to map photo-linear features, or lineaments. For the Adirondack region, with its relatively high density of faults, the imagery was also studied at 1:1,000,000. The identification numbers of the superior Landsat images, during the period from launch through March 1973, have been listed here (Isachsen 1974b). Our use of the term lineament refers to relatively sharp, straight alignment of drainage, topography, or other contrast which may be of natural origin. We believe that our identifications of lineaments have been conservative.

Several samples of Skylab color-infrared transparencies at 1:1,000,000, and multispectral scanner images at 1:1,000,000, were studied stereoscopically for additional linear features. Only a few of the lineaments found on the Landsat 1 imagery and high-altitude (U2) photography were observed, and no new ones were identified. Consequently the remaining Skylab products were not studied intensively.

A stereoscopic analysis was made of cloud-free high-altitude (U2) infrared transparencies (scale 1:130,000) which were flown by the Air Force for the eastern portion of the State. This high resolution photography covers a north-south strip 60 km wide which extends from the eastern border of the State to 74°30' west longitude, and from York City to 44°30' north latitude. The coverage also includes a 70 km wide which extends southeastward from Alexandria Bay to the St. Lawrence River to the aforementioned north-south strip. Photography has a resolution of about 3 meters where tonal contrast is high, and its use resulted in the discovery of numerous linear features not seen in the Landsat imagery.

The photo-lineaments were then screened to eliminate cultural features and leave only those which might be controlled by brittle deformation. The elimination of lithological features which parallel the strike of bedding or foliation introduces a considerable bias against fracture systems which may coincide with bedding. (This would apply, for example, to an analysis of the folded Hudson Valley and its border region to the west.) An additional bias in this elimination procedure was made for a small number of strike-slip faults which occur parallel to foliation in massive gneiss units in the Adirondacks; it was decided to include them on the map as possible fracture zones.

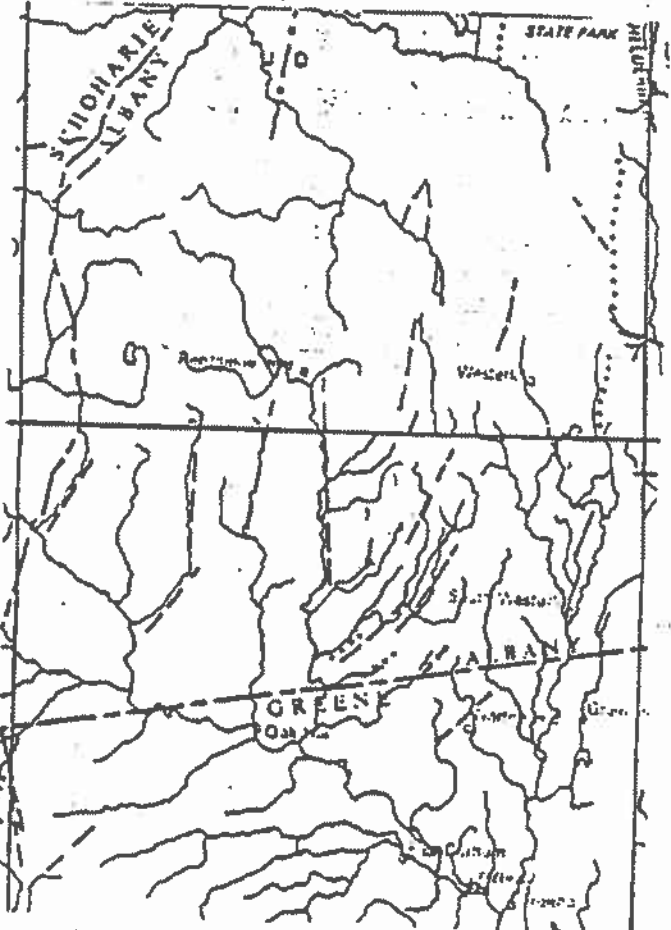
Factors bias the photogeological data (e.g. Isachsen 1973). In particular, it should be noted that the southeast-southwest orientation of Landsat 1 imagery creates shadow-enhancement of valleys orthogonal to the illumination direction, but diminishes visibility of those parallel to it.

Another factor that influences the mapping of photo-linear features is the scale at which the imagery is studied: the smaller the scale, the larger the features detected (e.g. Isachsen and others 1974). Thus, for example, at scales two or more orders of magnitude smaller, the Hudson-Champlain Valley would appear as a single mega-lineament. In the present compilation this "line" is a composite of hundreds of faults and photo-lineaments. This should not obscure the possibility that the "Hudson-Champlain hydrographic line" of Hobbs (1903) may be a fundamental tectonic lineament.

Preliminary Nature of Maps

We wish to emphasize that we have designated the brittle structures map as "Preliminary." This is based on our growing conviction from field work that linear topographic features which cut across lithological boundaries and foliation are either fault traces or zones of closely spaced joints, and that directed field work will confirm this prediction, at least in metamorphic terranes. Even during the present compilation, several linear Adirondack valleys were shown to be faults when isolated breccias noted in the literature were found to be aligned along their traces. The origin of tonal lines on the satellite imagery is more problematical. A number of these which were observed in the Adirondacks were found to be vegetation strips along straight stream courses of low relief (Isachsen 1974a). Other tonal lines, seen in forested areas on high-altitude aerial photographs, were totally lacking in topographic expression: these were interpreted as property lines and omitted from the compilation.

The brittle structures map is preliminary in yet another fundamental way. This may be seen in the complexity of the legend which was designed to encompass the wide range in precision of information given for faults in the literature. Thus, for example, information concerning individual faults ranges from relatively complete descriptions to mere point locations of faults or breccia zones. Here again, future directed field work may considerably sharpen and expand many of the present meager descriptions. In addition, new data pertaining to brittle deformation are currently being amassed at an accelerated rate because of the greatly expanded field activity connected with site selection for nuclear power plants. A prime example of this is the Hudson Highlands region, where only a portion of the recently-mapped faults could be shown at the scale of this compilation.



Topographic linear feature observed on one or more of the following: topographic map, Landsat (ERTS), Skylab, or U2 photography.

J

### Filtration versus Groundwater

At the request of the water committee I was asked to explain why the Town of Rensselaerville should pursue a groundwater supply rather than filter the existing source, Myosotis Lake. Below is a discussion of the reasons for pursuing a groundwater supply versus filtration.

#### Filtration:

1. The recent Federal Regulations pertaining to disinfection byproducts, and enhanced filtration will be more stringent. The district periodically has problems with disinfection byproducts. The total trihalomethane maximum contaminant level of 100 ppb will be reduced to 80 ppb. This will make it more difficult for the district to comply with the more stringent regulations.
2. The district periodically can not meet the turbidity requirements of less than 1. Please review my June 22, 1995 letter concerning your existing water system.
3. The reservoir, Myosotis Lake is shallow and its water quality will only deteriorate with time. Shallow reservoirs will produce high algal concentrations and aquatic weeds. Algae and weeds will hinder the filtration process and contribute to the formation of disinfection byproducts, taste, odor, and color.
4. The location of the existing intake pipe is inadequate. It is located in the middle of a stream. The impoundment is minimal and provides limited sedimentation of particles. This explains the flash turbidity problems.
5. Using a package filtration plant comprised of coagulation, flocculation, and filtration should produce an acceptable quality of water. It is advised that the package plant be pilot tested during the summer when the algal and weeds are plentiful. The package plant must be enclosed in a structure and heated. Periodically the filter backwashes to a lagoon. The settled waste is periodically collected and taken to a landfill. The existing site needs to be evaluated to assure there is sufficient room for a lagoon. The filtration facility will require diligent operator oversight to assure all the equipment is operational and properly maintained.
6. The longevity of a package filtration facility is 20 to 30 years. At that time the plant will require upgrading and/or replacement.
7. The existing slow sand filtration system should not be upgraded. Please refer to my June 22, 1995 letter which explains the reasons for not upgrading.

## Groundwater

- 1 Rensselaerville Water District has a reasonable chance of finding a ground water supply located in the proximity of the water distribution system. Provided the ground water supply is adequate in quantity and quality the major cost to operate would be electricity. Depending on the cost of electricity, distance to pump, elevation and condition of the pipes, it is estimated the electrical cost would be \$1000 to \$3000 per year.
2. The longevity of a well supply is indefinite. Occasionally the pump needs to be replaced. The major concerns are contamination and drought problems.
3. The groundwater supply will not be exposed to algae and weeds. Therefore the production of disinfection byproducts, taste, odor, and color should not be a problem. Also the well will not have the flash turbidity problems as experienced by the existing system.
4. A well supply will require much less operational and maintenance oversight.
5. The operational and maintenance costs for a groundwater supply are less than filtration.
6. In most cases the capital cost of constructing a well supply is less than building a filtration facility.

## Summary

A groundwater system is more economical to operate and maintain than a filtration facility. The capital cost should be less than constructing a filtration facility or upgrading your existing filtration facility. The longevity of a well system far exceeds that of a package filtration facility. More stringent regulations regarding filtration and disinfection byproducts will make it difficult for the district to be in compliance.

For all the reasons stated above it is recommended that the District pursue locating a groundwater supply.

Prepared by Douglas P. Ferguson, P.E.  
for the Rensselaerville Water District #1 Water Committee

## Advantages and Disadvantages of Slow Sand Filtration

### Advantages of Slow Sand Filtration

1. The design life of a slow sand filter plant far exceeds a package filtration plant. A package plant has a life of 20 to 30 years and a slow sand plant, 80 years.
2. Requires less operator expertise and oversight.
3. The operation and maintenance cost is negligible compared to a rapid sand filtration plant.
4. Chemicals are not needed.
5. Little or no heat is required for facility.
6. Does an effective job of removing giardia and bacteria.
7. Biological process rather than a physical chemical process and is very effective in removing microorganisms.
8. Most slow sand facilities are over 50 years old.
9. Less vulnerable to operator error.
10. No chemical sludge to remove and treat. The scrapings pose no environmental concerns.
11. If in the future, your community decides not to use the surface source or change treatment, the slow sand filters can be converted into finished water storage tanks with a capacity of about .60 million gallons.
12. Requires less operator oversight because it has no equipment.

### Disadvantages of Slow Sand Filtration

1. Does not provide flexibility to change treatment.
2. Takes up more space.
3. Engineers are not familiar with slow sand filter technology.
4. Construction will take longer.
5. Excessive algae will clog a slow sand filter.
6. Slow sand filter is not as effective in removing particulates, taste, and odor as the package plant.
7. Fine clay and mud will clog a slow sand filter. (Should not be a problem in your reservoir.)
8. More labor intensive - requires raking and shoveling media.

## Advantages and Disadvantages of Package Treatment Plants

### Advantages of Package Treatment Filtration

1. Produces a better quality effluent.
2. Takes up less space. Building to enclose unit will be considerably smaller.
3. Provides operating flexibility. Chemicals can be added to the water to improve the treatment should the source water changes quality.
4. The process can be automated.
5. Engineers are more familiar with package treatment plants than slow sand.
6. Plant is factory assembled and delivered to the construction site.
7. Less labor intensive.
8. More effective in removing taste, odor and color.

### Disadvantages of Package Treatment Plants

1. The life of a package plant is less than a slow sand plant. Its longevity will depend on how corrosive the water is and maintenance.
2. Electricity, heat and chemicals are required to operate the plant.
3. Sludge produced in the chemical process must be dried or frozen and periodically taken to the landfill.
4. Lagoons are required to treat the backwash water. After the solids have settled out, the liquid must be recirculated back into the treatment plant.
5. A tank is needed for backwashing the filter.
6. Daily operation and maintenance are critical to assure that the plant will properly run.
7. More prone to operator error.



Geology

Hydrology

Hazardous Waste

Water Supply

October 11, 1995

Ms. Lisa Mullenneaux  
464 Albany Hill Road  
Rensselaerville, New York 12147

Re: Recommended Well Locations  
Town of Rensselaerville, N.Y.

Dear Lisa:

I have completed the identification of sites that appear to have the greatest potential for yielding suitable quantities of ground water from the bedrock. The potential sites were identified by conducting a fracture trace analysis followed by a site visit to "ground-truth" the results. The results of the analysis are displayed on the attached map of the area that contains the Hamlet of Rensselaerville.

The identification of potential well sites from a fracture trace analysis is based on the premise that ground water is stored within and flows along fractures in the bedrock. Fractures and fracture zones also represent areas of deeper weathering, greater erosion and differences in soil characteristics that impact vegetation type. These characteristics manifest themselves as linear, visual and topographic features that are observable from air photographs and topographic maps.

The attached map contains the traces of linear features that I identified from air photographs and topographic maps. The results indicate that the majority of the linears are short, northeast oriented features that likely represent fractures in the rock referred to as joints. There are also a few northerly oriented linears that extend for several thousand feet. These longer linears may be larger, regional fractures or faults that cut across the joints. One of these major linears extends from the south side of the Hamlet of Rensselaerville northward past the Town Park and crosses Route 85 at a point approximately 1500 feet east of Shoefelt Corners. A second major linear starts at the Hamlet of Rensselaerville and follows Route 85 northward and passes approximately 600 feet west of Shoefelt Corners. A residential well, located on the west side of Route 85 and approximately 350 feet north of the end of Route 85, has been drilled into bedrock within this potential fracture zone. The well has an unconfirmed, reported yield of 60 gallons per minute (gpm). If this yield is correct, the fractures in the area do have the potential for supporting the needs of the community water supply.

The prime targets for a bedrock well are those that are along the major north-south features, preferably at the intersection of the north-south features and the shorter fracture traces, and at locations that are proximal to the water main. Four potential locations have been marked on the attached map in order of their preference. The first location is the residential well with the

Ms. Lisa Mullenneaux  
Page 2  
October 11, 1995

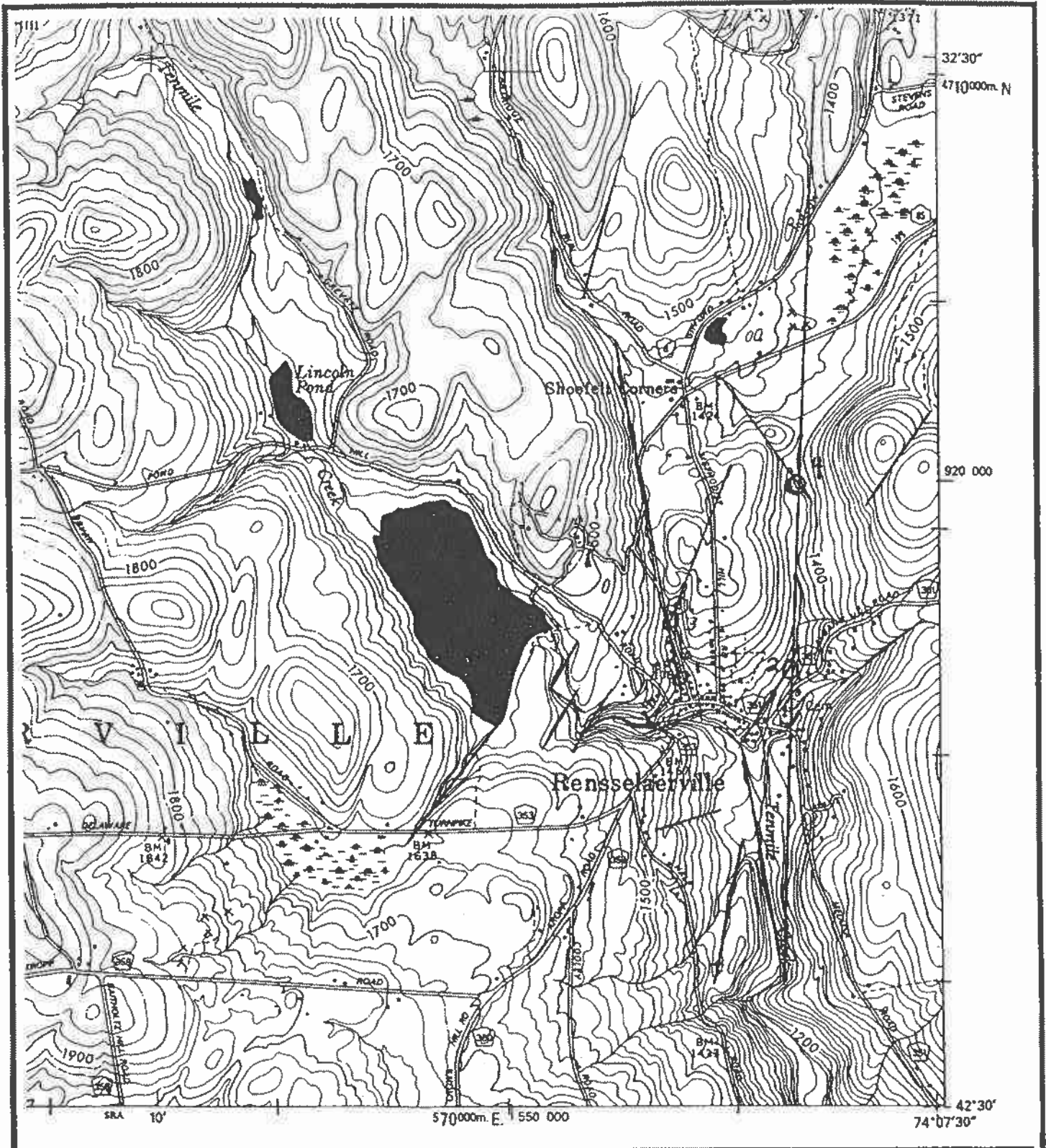
reported yield of 60 gpm. If this well does yield at the reported rate, it should be considered since the well is adjacent to the water main and would reduce exploration and development costs. The second choice is a site north of the Town Park. A well(s) could be placed anywhere in the center of the valley between the park and the intersection of the north-south linear and the northeast oriented linear. The third option is on the east side of Route 85, north of the firehouse and at the intersection of the north-south linear and a northeast oriented linear. The fourth option is north of option number 2 and is again at the intersection of two linear features. The fourth option has serious limitations due to access and distance to the water system.

Please do not hesitate to call me with questions regarding these recommendations. We can also provide you assistance in evaluating drilling data, conducting pumping tests and evaluating the pumping test data. Thank you for the opportunity to be of service.

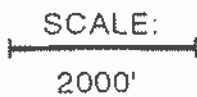
Sincerely,  
Alpha Geoscience

  
Samuel W. Gowan  
Geologist

SWG:ce  
attachment

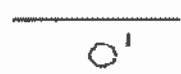


Rensselaerville Quadrangles  
 New York State  
 Department of Transportation  
 7.5 Minute Series

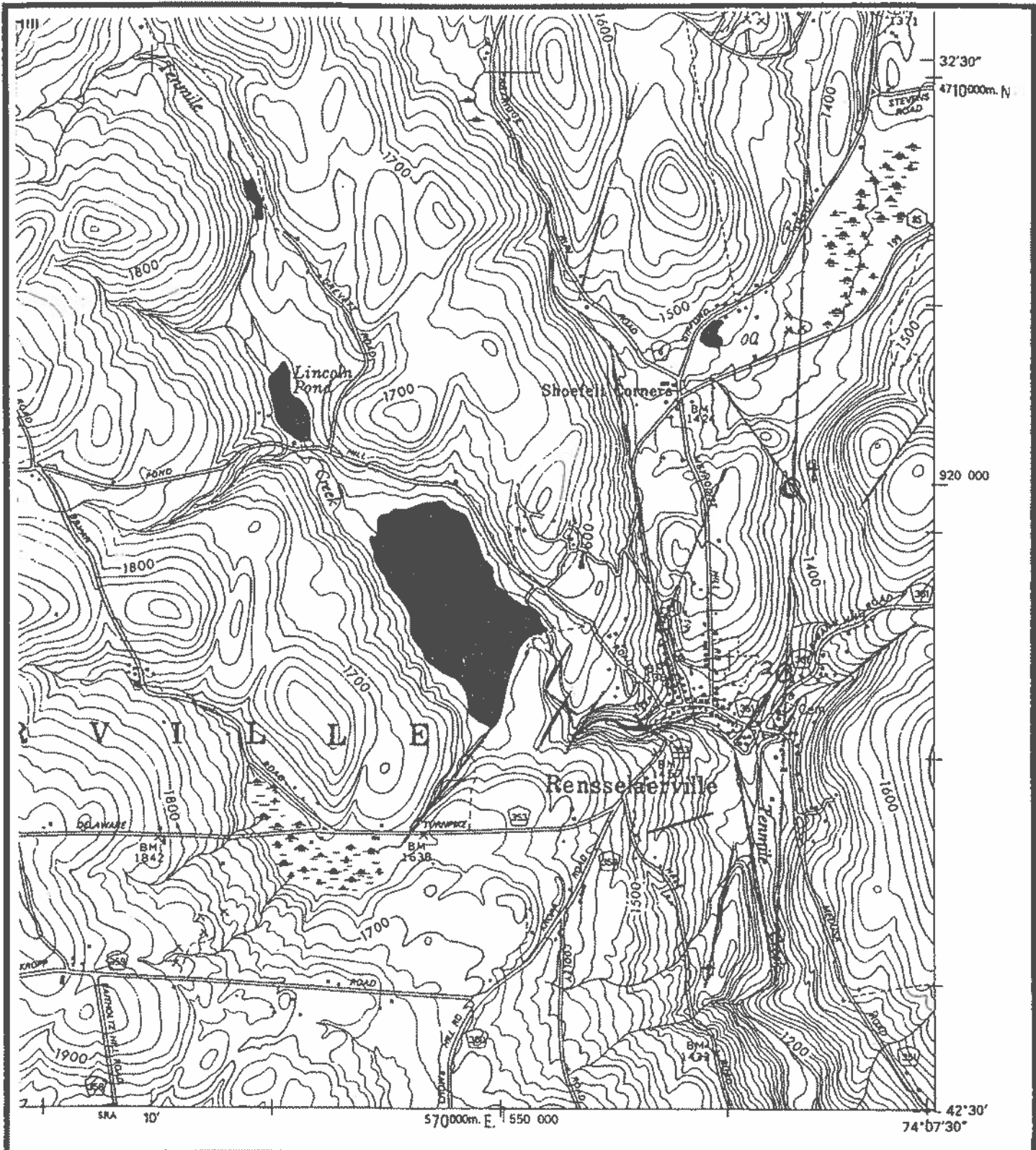


Fracture Trace and Recommended  
 Well Site Location

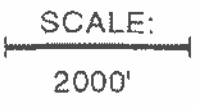
Town of Rensselaerville  
 Albany County, New York



Fracture Trace and  
 Recommended Well Location



Rensselaerville Quadrangles  
 New York State  
 Department of Transportation  
 7.5 Minute Series

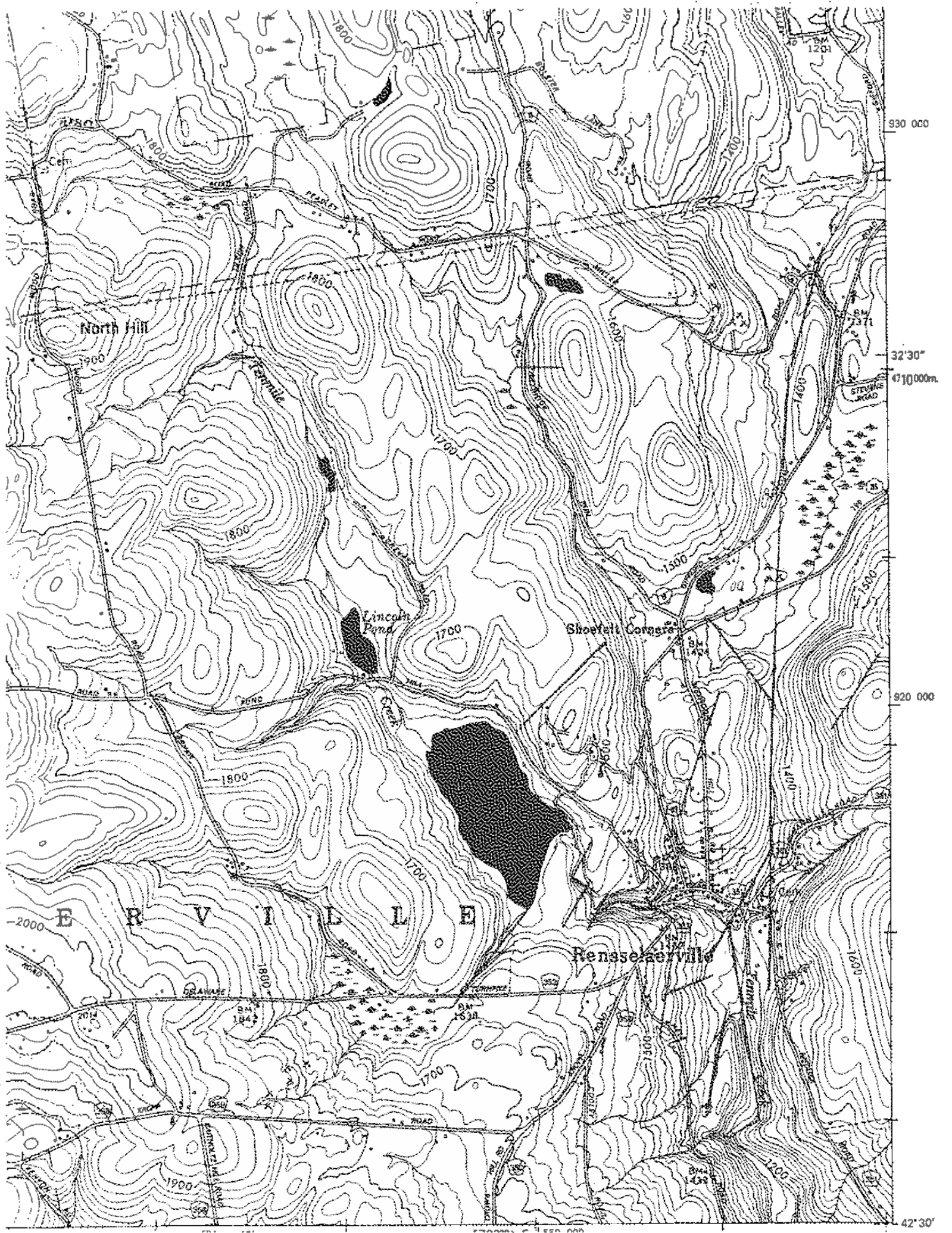


Fracture Trace and Recommended  
 Well Site Location

Town of Rensselaerville  
 Albany County, New York



Fracture Trace and  
 Recommended Well Location

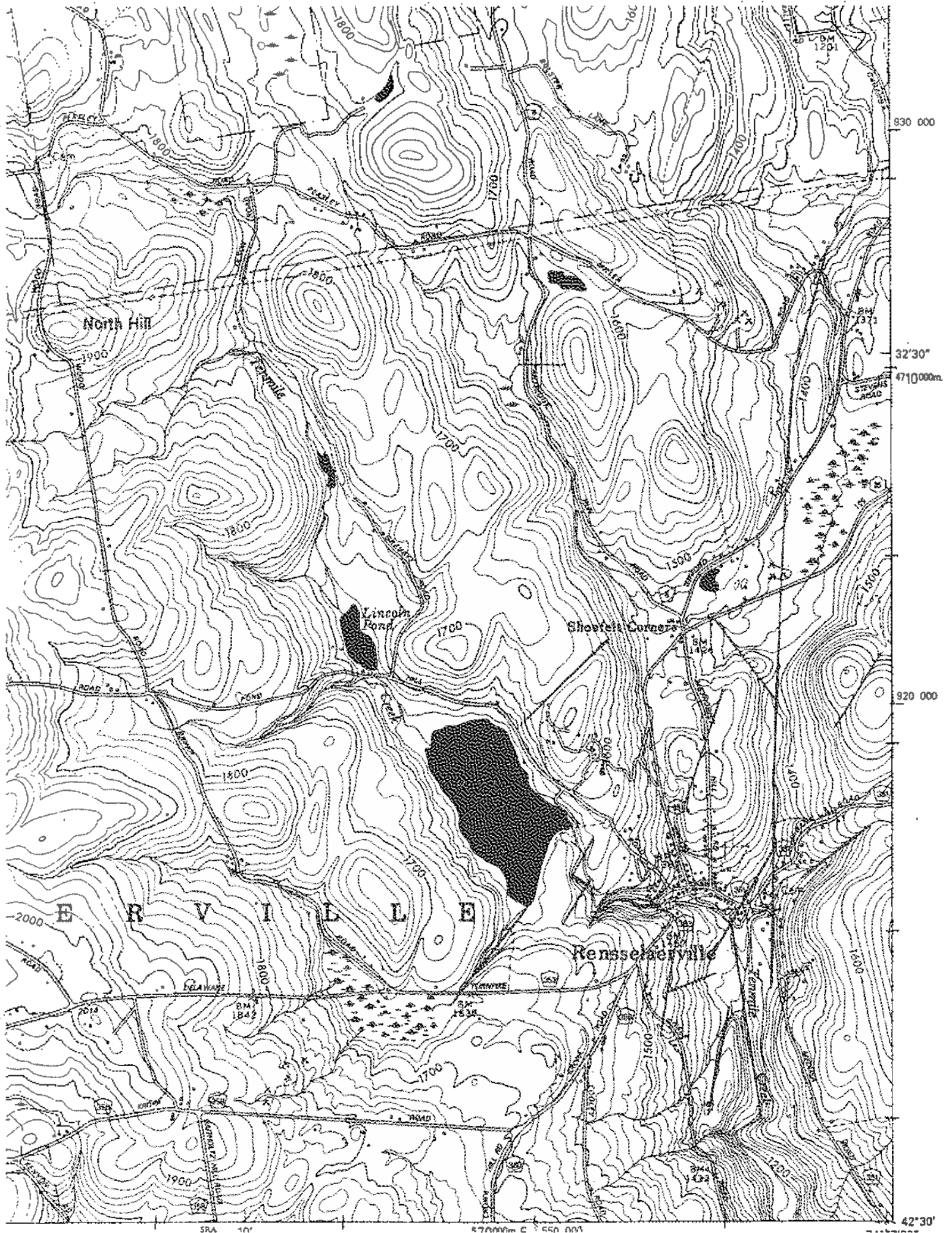


930 000

42°30'  
71°00'00"

920 000

42°30'



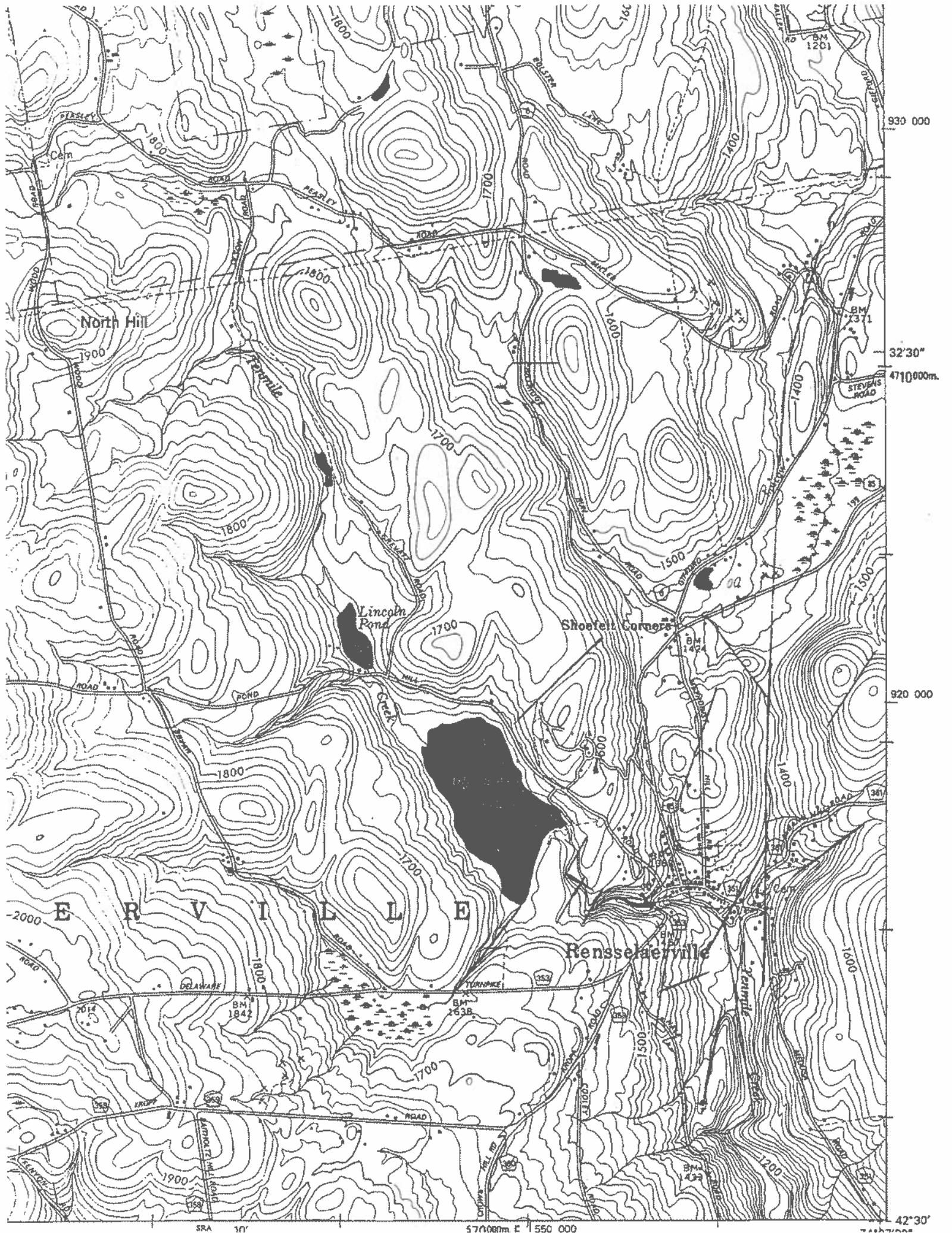
930 000

32°30'  
471000m

920 000

42°30'

SRA 10' 57000m E 550 000



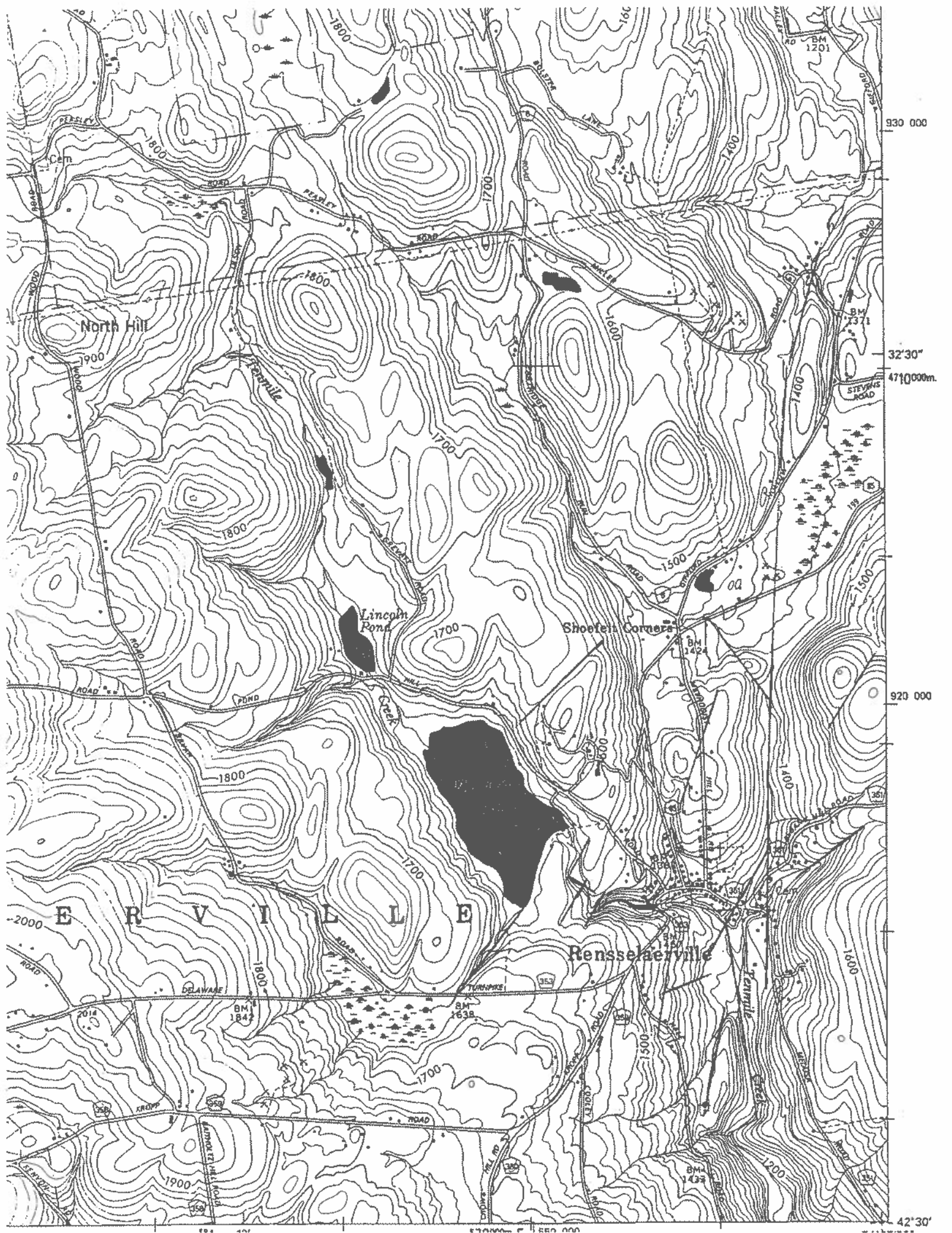
930 000

32°30'  
471000m

920 000

42°30'

SRA 107 570000m E 550 000



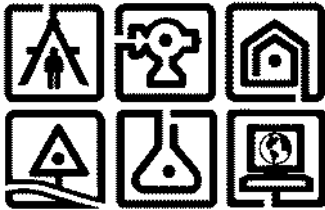
930 000

32'30"  
4710000m.

920 000

42'30"

March 5, 2024



Rensselaerville Water District  
Source Water Assessment  
Town of Rensselaerville  
Albany County, New York

*Prepared for:*

Edwin Csukas, Water Committee Chair  
Town of Rensselaerville  
87 Barger Road  
Medusa, New York 12120

*Prepared by:*

C.T. MALE ASSOCIATES  
50 Century Hill Drive  
Latham, New York 12110  
(518) 786-7400  
FAX (518) 786-7299

*C.T. Male Associates Project No: 24.4005*

**RENSSELAERVILLE WATER DISTRICT  
SOURCE WATER ASSESSMENT**

**TABLE OF CONTENTS**

	<b><u>Page</u></b>
1.0 INTRODUCTION .....	1
2.0 SOURCE WATER.....	1
3.0 WATER TREATMENT PLANT .....	2
4.0 POTENTIAL SOURCES OF CONTAMINATION .....	2
5.0 ONGOING WATERSHED PROTECTION ACTIVITIES.....	5
6.0 EXISTING WATER QUALITY TRENDS.....	5
7.0 SOURCE WATER PROTECTION NEEDS.....	6

**Figures**

Figure 1 – Watershed and Zoning District Map

Figure 2 – Site Location Map

**Appendices**

Appendix A – 2022 Annual Water Quality Report (AWQR)

Appendix B – List of Available Information

Appendix C – Contaminant Inventory

Appendix D – THM and HAA Data

Appendix E – Water System Design Report by Kaaterskill Associates (August 2021)

Appendix F – Public Notice of DOH Violations

## 1.0 INTRODUCTION

The Rensselaerville Water District has contracted C.T. Male Associates (C.T. Male) to assess the contaminant threats to the drinking water supply of the Rensselaerville Water District (District). C.T. Male has prepared this Source Water Assessment to provide information to support local and state efforts to protect the District's public drinking water source. The information contained in this assessment pertains to the source of water delivered by the District's Water System. The emphasis of this assessment is on "source" water rather than "tap" water. Information on tap water quality is available in the District's Annual Drinking Water Quality Report, which is attached as Appendix A.

Each step of this assessment follows the methodology described in the New York State Source Water Assessment Program Plan, published November 1999. A comprehensive list of the available information utilized in this assessment is included in Appendix B.

## 2.0 SOURCE WATER

The source of water for the Rensselaerville Water District is the Ten Mile Creek immediately downstream of the spillway on the dam at Lake Myosotis, which forms the headwaters for the Ten Mile Creek. The District has a 6" raw water intake within the impoundment of the Rensselaerville Water Supply dam, which is located on the Ten Mile Creek, 1,350 feet downstream of the Lake Myosotis Dam. The location of the intake is attached as Figure 2.

There is relatively little impoundment behind the Rensselaerville Water Supply Dam and since the raw water intake is approximately ¼ mile downstream of the spillway for Lake Myosotis, nearly the entire watershed tributary to the raw water intake would be the watershed of Lake Myosotis. Therefore, the source water assessment focuses on Lake Myosotis. Lake Myosotis covers approximately 101 acres, has an estimated storage capacity of 143 Million Gallons, and has a total watershed area of 6.73 square miles. The watershed is zoned as approximately seventy percent Resource Conservation (sixty-six percent Area 1, four percent Area 3), sixteen percent Reforestation, fourteen percent Residential/Agricultural/Rural, and less than one percent Hamlet. The watershed includes areas within the Town of Rensselaerville and the Town of Berne. A watershed map, including land use delineation is attached as Figure 1. The estimated population of the watershed area is approximately 183 residents.

### **3.0 WATER TREATMENT PLANT**

The raw water undergoes a multi-step process at the Rensselaerville Water Treatment Plant located on Rice Road to treat and disinfect the water before being distributed to the users in the system. The raw water passes through an initial settling chamber and is amended with sodium permanganate. The water is further purified by passing through a slow sand filter. The plant utilizes aeration prior to the slow sand filter in the warmer months, to raise the dissolved oxygen levels in the raw water. The filtered water is then passed through a granular activated carbon filter (installed in 2021), and finally disinfected with sodium hypochlorite (chlorine). The finished water is stored in a 50,000 gallon clearwell, which is located at the treatment plant site on Rice Road, flowing by gravity to users within the system.

The Rensselaerville Water Treatment Plant conducts regular water quality testing, as required by the New York State Department of Health (NYSDOH). According to the 2022 Annual Water Quality Report (AWQR), the Rensselaerville Water District has detected eight (8) contaminants in the finished water, three (3) of which were measured to be in violation of NYSDOH regulatory limit. The three contaminants in violation include turbidity, trihalomethane (TTHMs), and haloacetic acids (HAAs). Refer to the 2022 AWQR, attached as Appendix A, for further information regarding the quality of the system's finished (tap) water.

### **4.0 POTENTIAL SOURCES OF CONTAMINATION**

This assessment evaluates contaminants that may enter the water drawn from Ten Mile Creek, directly at the impoundment created by the Rensselaerville Water Supply Dam. The headworks of the creek is fed by Lake Myosotis, and captures the Lake Myosotis watershed. The contaminants addressed in this assessment include those regulated under the federal Safe Drinking Water Act as well as those which the NYSDOH has determined may present a concern to public health. A description of the significant potential sources of contamination associated with the Lake Myosotis watershed are provided within this assessment. Each significant potential source of contamination has been analyzed and prioritized (low, medium, and high) according to its potential to impact the water supply. The contaminant inventory matrix is included in Appendix C. Potential sources of contamination of concern, rated either medium or higher priority are summarized in the table below:

Potential Sources of Contamination	Contaminants of Concern	Description	Potential Impact to Source Water Quality
Land Use - Pasture	Disinfection Byproduct Precursors*, Nitrates**, Protozoa, Enteric Bacteria & Enteric Viruses	<ul style="list-style-type: none"> <li>• Fertilizer, a source of nitrate is used on cropland within the Lake's watershed.</li> <li>• Elevated Nitrate levels have been recorded in the finished water supply.</li> <li>• Approximately 8% of the watershed is comprised of Pasture.</li> </ul>	Medium
On-site Septic Systems	Nitrates**	<ul style="list-style-type: none"> <li>• An estimated ±157 properties in the watershed are served by an on-site septic system.</li> <li>• There are no properties located within at least 250' of the Lake Myosotis shoreline.</li> <li>• The condition and age of septic systems in the watershed is unknown.</li> </ul>	Medium

\*Indicates Contaminant with known violation at Rensselaerville WTP  
 \*\*Indicates Contaminant detected at Rensselaerville WTP (not in violation)

As indicated above, the water source appears to be moderately protected from potential contaminants in the watershed. All land cover types within the watershed were evaluated to determine their potential impact on the source water. Of the ten (10) cover types which exist in the watershed, the presence of pasture was the only land use of medium concern.

All land cover types in the watershed were evaluated as part of this assessment. Aside from pasture, no other land types raised concern for medium or higher risk of contamination. Other land types examined include water, low intensity residential, other

grasses, evergreen forest, mixed forest, deciduous forest, wood wetlands, emergent wetlands, and barren (bare rock and sand).

The land classified as pasture makes up approximately 8% of the watershed, which is not substantial enough to increase the risk of contamination from medium to high. The pastureland within the watershed is primarily utilized for the production of hay, which is a crop not typical to needing pesticide application. While these areas could be utilized for grazing of livestock, there are no known farms of significant size within the watershed area. While the presence of pasture within the watershed holds a potential risk factor of “medium”, under current conditions, the contamination risk is perceived to be low.

The watershed was also evaluated for risk of potential contamination from discrete sources, including TRI Facilities, solid waste sites, waste water treatment facilities, other SPDES Facilities, bulk storage facilities, petroleum spills, hazmat spills, and CERCLIS. The only perceived source of contamination, of the evaluated discrete sources, would be the presence of on-site septic systems within the watershed.

Land use and on-site septic systems within the watershed can be perceived as a medium risk to the water quality of the source water. While The Town of Rensselaerville does provide sanitary sewer treatment to some of its residents, there are no other public sanitary sewer systems in or around the watershed. For the purpose of this assessment, it is assumed that all residences in the watershed have on-site septic systems.

According to data received from the 2020 Census, the watershed has a population of 183 residents. There are 157 developed parcels within the watershed, including 122 residential parcels, all of which are located greater than 250-feet from the Lake Myosotis shoreline. Assuming each property is served by its own on-site septic system, it is believed that there are approximately 157 septic systems within the 6.73 square mile watershed. This is a very low concentration of septic systems within the watershed, and while the potential for contamination from on-site septic systems is still a medium risk, overall the risk should be perceived as low under current circumstances.

## 5.0 ONGOING WATERSHED PROTECTION ACTIVITIES

A majority of the watershed includes land classified as resource conservation areas. Areas including, adjacent to, and surrounding Lake Myositis are a part of the Huyck Preserve and Biological Research Station. The continued preservation of this area for recreational and conservation uses, should continue to maintain protection of the water source.

## 6.0 EXISTING WATER QUALITY TRENDS

The Rensselaerville Water Treatment Plant has routinely monitored finished water quality, as required by the NYSDOH. Records dating back as far as 1986 show that the District has consistently been near or in excess of the MCLs for various disinfection byproducts (DPBs), including THMs and HAAs. Records provided by the District are included in Appendix D.

In an effort to address the violations, the District had hired Kaaterskill Associates to design and implement modifications to their existing water treatment process. As a result of the report, and with approval by the Albany County Department of Health, a Granular Activated Carbon (GAC) tank was implemented for targeted treatment of DBPs. The Report and approval letter from Albany County DOH are included in Appendix E. Due to site restraints at the existing plant, the GAC filter cannot be backwashed in place, however a detailed Operational Procedure for replacing the GAC, including the planning of frequency of replacements, and additional operational recommendations are detailed in the report.

The GAC Tank was installed and put online in 2021. Since the GAC tank was installed, there has not been an observed decrease in DBPs. The District has continued to be in violation of MCLs associated with THMs and HAAs. Testing results from February 2021 to May 2022 triggered two separate notifications to the users of the system for elevated MCLs. Actions taken since include the removal of a beaver dam upstream of the water plant intake, increase regularity of hydrant flushing, the refresh of GAC in their tank, and working with the GAC filter design firm, East Coast Filter for further recommendations. East Coast Filter did recommend the replacement of the GAC with a different GAC media that previously used.

Between the dates of August 8, 2022 and August 23, 2022, samples of finished water collected were measured to be in excess of the MCL for turbidity. Although it was

believed to be a seasonal condition of the raw water, the District added a permanganate dosing pump to treat the raw water entering the plant. Copies of the public notifications regarding the 2021 and 2022 MCL violations are attached within Appendix F.

While the purpose of this report is not to perform a detailed review into the water quality violations, there are clear trends that indicate that either the existing water treatment plant, the water source, or a combination of both factors, result the plant frequently exceeding water quality standards for disinfection byproducts and for turbidity. With regards to the 2022 exceedances for turbidity, this can be related to seasonal water quality depending on weather factors during August of 2022. High turbidity in creeks or streams generally occurs after a period of significant heavy rain. In the case of this water source, turbidity could also be a factor depending on operation of the Lake Myosotis spillway and any low level flow controls. Disinfection byproduct formation is a greater concern for water supplies with a surface water as their source, since DBP formation is related to organic content in raw water supply.

## **7.0 SOURCE WATER PROTECTION NEEDS**

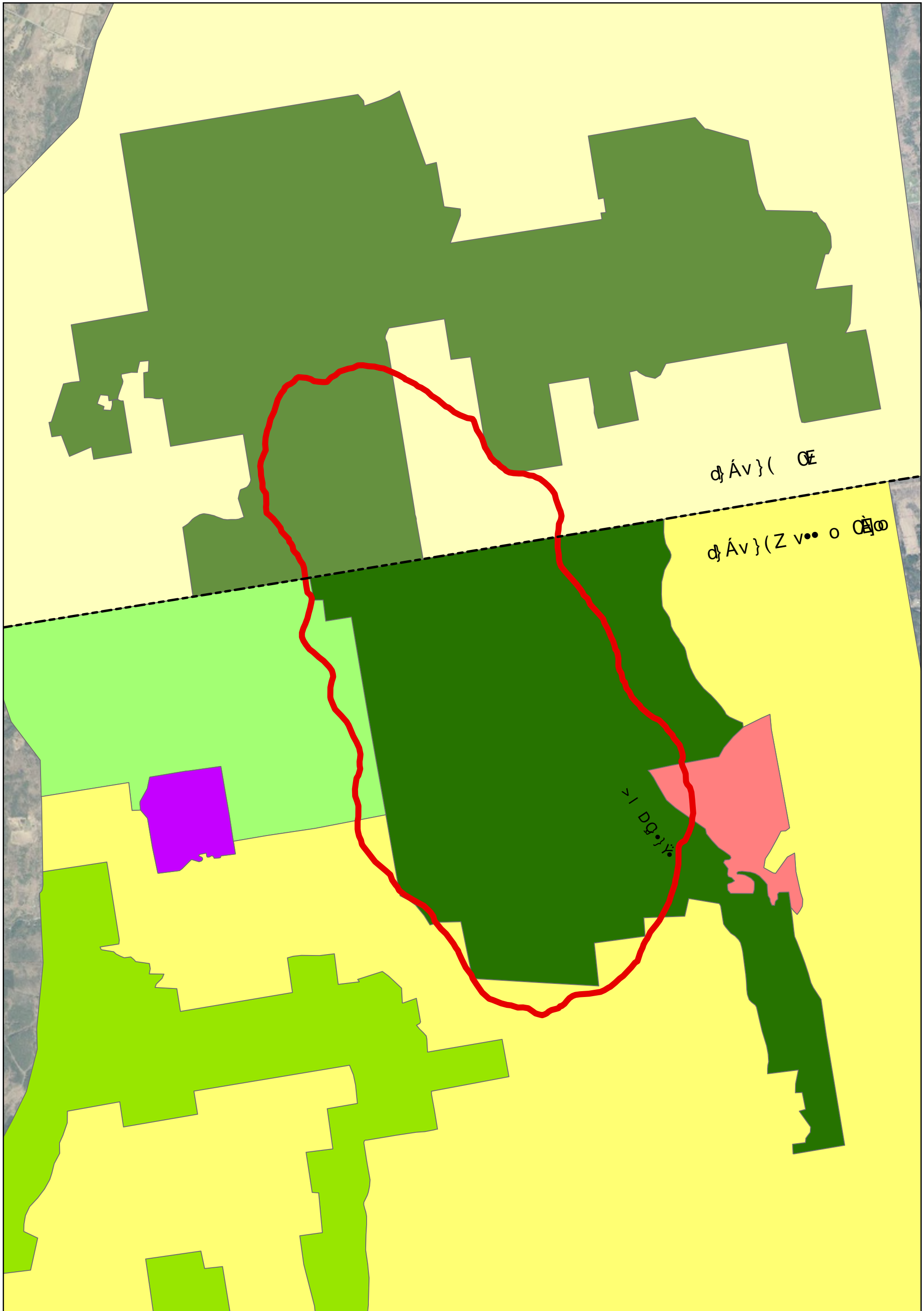
Based upon this evaluation, it is determined that the land uses within the watershed do not pose a significant risk of water quality or contamination of Lake Myosotis, which is positive to note when assessing Lake Myosotis and the Ten Mile Creek immediately downstream of the dam's spillway as a raw water source for the Rensselaerville Water District.

Even though the land uses within the watershed do not pose a significant risk to water quality or contamination, the historic exceedance of disinfection byproducts in the system indicates that raw water organic content is not ideal. If the District continues to utilize this location for water supply, additional sampling of the raw water and consideration to improved treatment or disinfection technologies will need to be assessed.

**FIGURES**

**FIGURE 1**

Watershed and Zoning District Map



**e**

3URMHFW 1XPEHU  
 'DWD 6RXUFH 1<6\*,6 &OHDULQJKRXVH  
 3URMHFWLRQ :\*6  
 'DWH -DQXDU\  
 )LOH /DNH 0\RVRWLV DSUJ  
 \*,6 & %RQGL

> P v  
 ■ Z r i r Z •}µœ }v• œÁ vœÇ•s o > |  
 ■ Z r i r Z •}µœ }v• œÁ vœ il DÇ•)Ÿ• t s œ•Z  
 ■ Z r i r Z •}µœ }v• œÁ v œv Z (}œ•s Ÿv œ  
 ■ Pœ] µœµœ o Zµœ o Z vœvo Z •] vŸ o Pœ] µœµœ  
 ■ , uo s — d}Áv >|v

0LOHV  
 LQ 0LOHV

**&]Pµœ í**

5HQVVHODHUYLOOH %HUQH =RQLQJ 'LVWULFWV  
 5RZœ)R'54HQVVHODHUYLOOH \$OEDQ\ &RXQW\ 1<

**C.T. MALE ASSOCIATES**  
 Engineering, Surveying, Architecture, Landscape Architecture & Geology, S.P.C.  
 55 CENTURY HILL DRIVE, LATHAM, NY 12110  
 516.766.7400 • FAX 516.766.7299

M:HZo<RUN\6WDWH

**FIGURE 2**

Site Location Map



**C.T. MALE ASSOCIATES**  
 Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.  
 50 CENTURY HILL DRIVE, LATHAM, NY 12110 PH: 518.786.7400  
 GLENS FALLS, NY • JOHNSTOWN, NY • POUGHKEEPSIE, NY • SYRACUSE, NY



**SITE LOCATION MAP**

**RENSSELAERVILLE WATER DISTRICT  
SOURCE WATER ASSESSMENT**

PROJ. NO.: 24.4005	DRAFTED: BFJ	SCALE: 1" = 300'	DATE: 03/05/2024	TOWN OF RENSSELAERVILLE	ALBANY COUNTY, NEW YORK
--------------------	--------------	------------------	------------------	-------------------------	-------------------------

**APPENDICES**

**APPENDIX A**

2022 Annual Water Quality Report (AWQR)

***Annual Drinking Water Quality Report for 2022***  
***Rensselaerville Water District***  
***Rensselaerville, New York***  
***(Public Water Supply ID# NY0100202)***

**INTRODUCTION**

To comply with State regulations, Rensselaerville WD will be annually issuing a report describing the quality of your drinking water. The purpose of this report is to raise your understanding of drinking water and awareness of the need to protect our drinking water sources. This report provides an overview of last year's water quality. Included are details about where your water comes from, what it contains, and how it compares to State standards.

We had violations of the drinking water standards in 2022 for an exceedance in total trihalomethane (TTHM) and haloacetic acids (HAA5) which is discussed later in this report. We have installed a stand-alone granular activated carbon filter, which has been online since August 2021, in order to mitigate this issue. We have also added a sodium permanganate amendment to the raw water coming into the filter plant. Our constant goal is and always has been, to provide to you a safe and dependable supply of drinking water. We also had turbidity exceedance violation for turbidity greater than 1.0 NTU, from August 6 to August 23, 2022.

If you have any questions about this report or concerning your drinking water, please contact John Rice, Water Operator, (518) 810-7219. We want you to be informed about your drinking water. If you want to learn more, please attend any of our regularly scheduled water district committee meetings. The meetings are typically held the first Thursday of the month at 7pm.

**WHERE DOES OUR WATER COME FROM?** - In general, the sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and can pick up substances resulting from the presence of animals or from human activities. Contaminants that may be present in source water include: microbial contaminants; inorganic contaminants; pesticides and herbicides; organic chemical contaminants; and radioactive contaminants. In order to ensure that tap water is safe to drink, the State and the EPA prescribe regulations which limit the amount of certain contaminants in water provided by public water systems.

The source of our water is Lake Myosotis, which is located at the headwaters of Ten Mile Creek. The Rensselaerville water treatment facility employs a multi step process to purify your water. The water from Lake Myosotis initially passes through settling chamber to remove particles. The raw water is amended with sodium permanganate. The water is further cleaned by a slow sand filter. In the warmer months, aeration is used before the slow sand filter to raise dissolved oxygen levels in the raw water. After passing through the slow sand, the filtered water then passes through a granular activated carbon filter, and finally disinfected with sodium hypochlorite (chlorine) and stored in a 50,000 gallon clearwell before distribution to your homes.

**ARE THERE CONTAMINANTS IN OUR DRINKING WATER?** - As the State regulations require, we routinely test your drinking water for numerous contaminants. These contaminants include total coliform, inorganic compounds, nitrate, nitrite, lead and copper, volatile organic compounds (petroleum products and solvents), and synthetic organic compounds (herbicides and pesticides). The table presented below depicts which compounds were detected in your drinking water. A separate table is also included showing contaminants that were tested and not detected. The State allows us to test for some contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of our data, though representative, are more than one year old.

It should be noted that all drinking water, including bottled drinking water, may be reasonably expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800-426-4791) or the Albany County Health Department at (518) 447-4620.

Table of <u>Detected</u> Contaminants							
Contaminant	Violation Yes/No	Date of Sample	Level Detected	Unit of Measure	MCLG	Regulatory Limit (MCL, TT or AL)	Likely Source of Contamination
Turbidity <sup>1</sup>	Yes	Daily 8/6-8/23/22	<1 >1	NTU	N/A	TT = at least 95% of samples < 1.0	Erosion of soils
Barium	No	6/5/19	0.012	mg/L	2	2 (MCL)	Erosion of natural deposits
Lead <sup>2</sup>	No	3/17/22 12/14/22	0.0093 ND-0.0094	mg/L	0	0.015 (AL)	Corrosion of household plumbing systems.
Copper <sup>2</sup>	No	3/17/22 12/14/22	0.338 0.027-0.78	mg/L	1.3	1.3 (AL)	Corrosion of household plumbing systems.
Nitrate	No	3/17/22	0.156	mg/L	10	10 (MCL)	Erosion of natural deposits, or runoff from agricultural practices
TTHMs <sup>3</sup>	Yes	quarterly	RAA 69.9 28.6-122	ug/L	N/A	80 (MCL)	Bi-product of chlorination
HAA5 <sup>3</sup>	Yes	quarterly	RAA 52.6 42-77.2	ug/L	N/A	60 (MCL)	Bi-product of chlorination
Iron	No	12/6/21	0.0558	mg/L	N/A	0.3 (MCL)	Naturally Occurring

**Notes:**

1 - Turbidity is a measure of the cloudiness of the water. We monitor it because it is a good indicator of the effectiveness of our filtration system. Our highest single turbidity measurement for the year occurred on 8/12/22 (2.38 NTU). State regulations require that turbidity must always be less than or equal to 1.0 NTU.

2 - During 2022, 20 samples were collected and analyzed for Lead & Copper. The value above represents the 90<sup>th</sup> percentile. In other words 90% or more of our samples were below the action level for both lead and copper.

3 - Drinking water containing these disinfection byproducts in excess of the MCL *may* lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of getting cancer.

**Definitions:** ≤ - Less than

**Maximum Contaminant Level (MCL):** The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible.

**Maximum Contaminant Level Goal (MCLG):** The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**Maximum Residual Disinfectant Level (MRDL):** The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

**Maximum Residual Disinfectant Level Goal (MRDLG):** The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contamination

**Action Level (AL):** The concentration of a contaminant that, if exceeded, triggers treatment or other requirements which a water system must follow.

**Milligrams per liter (mg/l):** Corresponds to one part of liquid in one million parts of liquid (parts per million - ppm).

**Micrograms per liter (ug/l):** Corresponds to one part of liquid in one billion parts of liquid (parts per billion - ppb).

Table of Contaminants Monitored But <u>Not Detected</u>			
Contaminant	Date of Last Sample	Required Frequency	Comment
Total Coliform Bacteria	Monthly	Monthly	Testing for E. coli required if Total Coliform is detected
Inorganic Chemicals – Group 1	3/15/22	3 Years	Arsenic, Cadmium, Chromium, Fluoride, Selenium, Mercury
Inorganic Chemicals – Group 2	3/15/22	3 Years	Antimony, Beryllium, Cyanide, Nickel, Thallium, Sulfate
Synthetic Organic Chemicals	3/15/22	3 Years	Group of 33 Pesticides & Herbicides
Principal Organic Chemicals	6/5/19	6 Years	Group of 57 Solvents, petroleum products and Vinyl Chloride
Gross Alpha & Beta Radioactivity	7/20/22	9 Years	Naturally occurring
PFOA, PFAS, 1-4,Dioxane	10/6/22 12/14/22	3 years	Released into the environment from widespread use in commercial and industrial applications

Manganese	12/6/21	N/A	Manganese is a common element in rocks, soil, water, plants, and animals. Manganese occurs naturally in water after dissolving from rocks and soil. Contamination of drinking water may occur if manganese gets into surface or groundwater after dissolving from rocks and soil.
-----------	---------	-----	---

**WHAT DOES THIS INFORMATION MEAN?** — We have learned through our monitoring and testing that some contaminants have been detected; however, these compounds were detected below New York State requirements, with the exception of the Turbidity, TTHM & HAA5 exceedances. MCL’s are set at very stringent levels.

**TRihalOMETHANES**

Trihalomethanes are a group of chemicals that are formed in drinking water during disinfection when chlorine reacts with naturally occurring organic material (e.g., decomposing vegetation such as tree leaves, algae or other aquatic plants) in surface water sources such as rivers and lakes. They are disinfection byproducts and include the individual chemicals chloroform, bromoform, bromodichloromethane, and chlorodibromomethane. The amount of trihalomethanes formed in drinking water during disinfection can change from day to day, depending on the temperature, the amount of organic material in the water, the amount of chlorine added, and a variety of other factors.

Disinfection of drinking water by chlorination is beneficial to public health. Drinking water is disinfected by public water suppliers to kill bacteria and viruses that could cause serious illnesses, and chlorine is the most commonly used disinfectant in New York State. All public water systems that use chlorine as a disinfectant contain trihalomethanes to some degree.

Some studies suggest that people who drank water containing trihalomethanes for long periods of time (e.g., 20 to 30 years) have an increased risk of certain health effects. These include an increased risk for cancer and for low birth weights, miscarriages and birth defects. The methods used by these studies could not rule out the role of other factors that could have resulted in the observed increased risks. In addition, other similar studies do not show an increased risk for these health effects. Therefore, the evidence from these studies is not strong enough to conclude that trihalomethanes were a major factor contributing to the observed increased risks for these health effects. Studies of laboratory animals show that some trihalomethanes can cause cancer and adverse reproductive and developmental effects, but at exposures much higher than exposures that could result through normal use of the water. The United States Environmental Protection Agency reviewed the information from the human and animal studies and concluded that while there is no causal link between disinfection byproducts (including trihalomethanes) and human health effects, the balance of the information warranted stronger regulations that limit the amount of trihalomethanes in drinking water, while still allowing for adequate disinfection. The risks for adverse health effects from trihalomethanes in drinking water are small compared to the risks for illness from drinking inadequately disinfected water. (3/2016)

**HALOACETIC ACIDS**

Haloacetic acids are disinfection byproducts formed during treatment of drinking water by chlorine, the most commonly used disinfectant in New York State. Drinking water is disinfected by public water suppliers to kill bacteria and viruses that could cause serious illnesses. For this reason, disinfection of drinking water by chlorination is beneficial to public health. The amount of haloacetic acids in drinking water can change from day to day, depending on the temperature, the amount of organic material in the source water, the amount of chlorine added, and a variety of other factors.

The following paragraph summarizes and characterizes the available studies on human populations exposed to haloacetic acids, and provides a general summary of the health effects of haloacetic acids in animals, which occur at exposure levels much higher than exposures that could result through normal use of the water.

Some studies suggest that people who drank chlorinated drinking water containing disinfection by-products (including haloacetic acids) for long periods of time (e.g., 20 to 30 years) have an increased risk for cancer. However, how long and how frequently people actually drank the water, and how much haloacetic acids the water contained is not known for certain. Therefore, the evidence from these studies is not strong enough to conclude that the observed increased risk for cancer is due to haloacetic acids, other disinfection by-products, or some other factor. Studies of laboratory animals show that the two haloacetic acids, dichloroacetic acid and trichloroacetic acid, can cause cancer following exposure to high levels over their lifetimes. Dichloroacetic acid and trichloroacetic acid are also known to cause other effects in laboratory animals after high levels of exposure, primarily on the liver, kidney, and nervous system and on their ability to bear healthy offspring. The risks for adverse health effects from haloacetic acids in drinking water are small compared to the risk for illness from drinking inadequately disinfected water. (10/2018)



**APPENDIX B**

List of Available Information

Rensselaerville Water District - Source Water Assessment  
List of Available Information

<b>Data Used</b>	<b>Provided By/At</b>
Public Water System Data	Rensselaerville Water District
GIS Watershed Mapping	
DECinfo Locator	<a href="https://gisservices.dec.ny.gov/gis/dil/">https://gisservices.dec.ny.gov/gis/dil/</a>
EPA TRI Explorer	<a href="https://enviro.epa.gov/triexplorer/tri_factsheet.factsheet_forstate?pstate=ny&amp;pyear=2020&amp;pParent=TRI&amp;pDataSet=TRIQ1">https://enviro.epa.gov/triexplorer/tri_factsheet.factsheet_forstate?pstate=ny&amp;pyear=2020&amp;pParent=TRI&amp;pDataSet=TRIQ1</a>
CERCLIS Search	<a href="https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=&amp;dirEntryID=2785">https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=&amp;dirEntryID=2785</a>
Superfund NPL	<a href="https://www.epa.gov/superfund/search-superfund-sites-where-you-live#map">https://www.epa.gov/superfund/search-superfund-sites-where-you-live#map</a>

**APPDENIX C**  
Contaminant Inventory

Using Table 5 of NYSWAPP:

Contaminant	Cover Type									
	Water 2.39%	Low Intensity Residential 4.79%	Pasture 8.02%	Other Grasses 1.62%	Evergreen Forest 6.25%	Mixed Forest 20.81%	Deciduous Forest 51.85%	Woody Wetlands 3.46%	Emergent Wetlands 0.80%	Barren (Bare Rock and sand) 0.01%
<b>Known Problem Contaminants for Rensselaerville</b>										
Sediments/ Turbidity*	L(M)	M	L	N	N	N	N	L	L	M
Disinfection Byproduct Precursors*	L(M)	M	M(H)	L	L(M)	N(L)	N(L)	L(M)	L(M)	N
Metals**	N	L	L	L	N	N	N	N(L)	N(L)	N
Nitrates**	L	L	L(M)	L	N	N	N	L	L	N

**Other Contaminants Reviewed**

Halogenated Solvents	N	N(L)	N	N	N	N	N	N	N	N
Petroleum Products	N(L)	L	N	N	N	N	N	N	N	N
Pesticides/ Herbicides	N	M	M	M	L	N	N	L	L	N
Other Industrial Organics	N	L	L	L	N	N	N	L	L	N
Phosphorus	L	M	M	L	N	N	N	L	L	L
Protozoa	L	M(H)	H	L(M)	L	L	L	L(M)	L(M)	L
Enteric Bacteria	L	M	M(H)	L(M)	L	L	L	L(M)	L(M)	L
Enteric Viruses	L	M	M(H)	L(M)	L	L	L	L(M)	L(M)	L
Cations/ Anions (Salts, Sulfate)	N	L	L	L	N	N	N	L	L	L
Industrial Radionuclides	N	N	N	N	N	N	N	N	N	N

\*Indicates Contaminant with known violation at Rensselaerville WTP

\*\*Indicates Contaminant detected at Rensselaerville WTP (not in violation)

Using Table 8 of NYSWAPP:

**Contaminant Prevalance - Review of High (H) and Medium-High (M(H)) Rated items ONLY**

Contaminant	Cover Type	Rating	% Watershed	Susceptibility Zone	Evaluation of Contaminant Prevalance Associated with Mapped Land Cover
DBP	Pasture	High	8.02%	Zone 1	Medium
	Low Intensity Residential	High	4.79%	Zone 1	Low
Protozoa	Pasture	High	8.02%	Zone 1	Medium
Enteric Bacteria	Pasture	High	8.02%	Zone 1	Medium
Enteric Viruses	Pasture	High	8.02%	Zone 1	Medium

**APPENDIX D**

THM and HAA Data

Rensselaerville DBP History			
<u>Date</u>	<u>THMs</u>	<u>HAAs</u>	<u>Notes</u>
03/01/86	46.0		
08/21/86	69.0		
12/01/86	73.0		
03/31/87	91.0		
09/03/87	59.0		
07/12/90	60.0		
09/27/93	124.0		
10/13/93	123.4		
08/25/94	84.0		
12/24/94	121.0		
03/28/95	114.0		
06/22/95	80.0		
09/25/95	85.0		
09/26/96	71.6		
01/07/97	84.3		
05/20/97	93.1		
09/30/98	73.8		
08/02/99	75.0		
09/22/00	116.0		
09/21/01	134.0		
09/26/02	56.1		
09/30/03	99.0	84.0	
09/28/04	62.5		ACHD
12/15/04	54.5	50.3	Renss
07/28/05	68.9	43.0	Renss
09/10/05	68.1		ACHD
08/10/06	141.0	12.7	Renss
09/05/06	117.0		ACHD
11/28/06	110.0	116.0	Renss
Mean	88.1	61.2	
Range	46-141	13-116	
MCL (ug/L)	80.0	60.0	

Rensselaerville disinfection byproducts (ug/L)

<b>DATE</b>	<b>THM</b>	<b>HAA</b>		
<b>April 2016</b>	40.6	<b>63</b>		
<b>July 2016</b>	<b>89.1</b>	<b>110</b>		
<b>Oct. 2016</b>	51.1	53		
<b>Feb. 2017</b>	49.6	47		
<b>June 2017</b>	25.1	10.5		
<b>Oct. 2017</b>	31.4	30.4		
<b>March 2018</b>	65.9	<b>85</b>		
<b>April 2018</b>	62	<b>81.4</b>		
<b>July 2018</b>	64.2	<b>62.8</b>		
<b>Oct. 2018</b>	75.7	<b>89.4</b>		
<b>Jan. 2019</b>	67.4	<b>76.1</b>		
<b>April 2019</b>	37.4	47		
<b>July 2019</b>	74.5	<b>64.2</b>		
<b>Oct. 2019</b>	72.8	<b>77.6</b>		
<b>Jan. 2020</b>	58	<b>79.1</b>		
<b>May 2020</b>	57.7	58.7		
<b>Aug. 2020</b>	<b>86.5</b>	<b>67.1</b>		
<b>Nov. 2020</b>	46.7	39.4		
<b>February 2021</b>	65.2	<b>71.4</b>		
<b>May 2021</b>	47.1	<b>88.6</b>		
<b>Aug. 2, 2021</b>	<b>155</b>	<b>206</b>		
<b>Aug. 27, 2021</b>	<b>105</b>	<b>128</b>		
<b>Sept. 16, 2021</b>	<b>104</b>	<b>79</b>		
<b>Oct. 4, 2021</b>	<b>87.5</b>	<b>193</b>		
<b>Oct. 21, 2021</b>	76.7	<b>125</b>		
<b>Nov. 4, 2021</b>	<b>154</b>	<b>186</b>		
<b>Dec. 2, 2021</b>	<b>112</b>	<b>145</b>		

<b>Dec. 6, 2021</b>	<b>105</b>	<b>147</b>		
<b>Feb. 2, 2022</b>	<b>93.4</b>	<b>77.2</b>		
<b>Mar. 17, 2022</b>	69.6	50.2		
<b>May 5, 2022</b>	<b>122</b>	44.9		
<b>Aug 4, 2022</b>	35.7	42		
<b>Nov 17, 2022</b>	28.6	48.8		
<b>Feb 2, 2023</b>	50.6	<b>72.3</b>		
<b>May 1, 2023</b>	66	<b>74.8</b>		
<b>Aug 2, 2023</b>	<b>104</b>	<b>83.4</b>		
<b>Nov 2, 2023</b>	<b>93.6</b>	<b>80.3</b>		
<b>RAA</b>	78.6	<b>77.7</b>		
<b>MCL (ug/l)</b>	80.0	60.0		

**APPENDIX E**

Water System Design Report by  
Kaaterskill Associates (August 2021)



DANIEL P. McCOY  
County Executive

DEPARTMENT OF HEALTH  
COUNTY OF ALBANY  
175 GREEN STREET  
ALBANY, NEW YORK 12202

MARIBETH MILLER, BSN, MS  
Assistant Commissioner for Public Health

ELIZABETH F. WHALEN, MD, MPH  
Commissioner of Health

SHANNA F. WITHERSPOON, MPA  
Assistant Commissioner Finance and Administration

*The Dr. John J. A. Lyons*  
ALBANY COUNTY HEALTH FACILITY  
(518) 447-4580 FAX (518) 447-4698  
[www.albanycounty.com](http://www.albanycounty.com)

September 15, 2021

Victoria Kraker, Town Clerk & Collector  
Rensselaerville Town Hall  
87 Barger Road  
Medusa, NY 12120

RE: Water Supply Improvements  
Supplemental Granulated Carbon Filter Installation  
Town of Rensselaerville Water Treatment Plant  
ACHD # 21-310

Ms. Kraker:

Engineering plans, dated August 6, 2021, last revised August 23, 2021 submitted by Kaaterskill Associates for construction of the above water supply improvements were approved by this Department on August 31, 2021.

Enclosed is our Certificates of Approval.

We bring to your attention the following conditions which were the basis for approval:

- a. THAT the proposed works be constructed in complete conformity with the plans and specifications approved this day or approved amendments thereto.
- b. THAT the proposed works not be placed into operation until a completed works inspection and Certificate of Approval is issued by the Albany County Department of Health.
- c. THAT the Albany County Department of Health be notified when construction begins and is completed.
- d. THAT the construction of the facilities shall be under the supervision of a person or a firm qualified to practice professional engineering in the State of New York under the Education Law of the State of New York.



Albany County Department of Health is nationally accredited and meets rigorous public health standards set forth to best meet the needs of our community.

September 15, 2021

Page #2

e. THAT the supervising professional engineer shall certify to this Department before use of the improvements that the construction of such facilities has been under his supervision and that the works have been fully completed in accordance with the approved engineering reports, plans and specifications.

f. THAT the Albany County Department of Health receive copies of all laboratory analysis reports for water samples collected from the approved works following disinfection and flushing.

g. THAT the actual costs of water system improvements in this project be reported to this Department.

If there are any questions regarding the above approval, please let me know.

Sincerely,



Ronald L. Groves, P.E.  
Senior Public Health Engineer

Cc: John H. Eberhard, P.E., Kaaterskill Associates

NYSDOH Bureau of Public Water Supply



Albany County Department of Health is nationally accredited and meets rigorous public health standards set forth to best meet the needs of our community.

**General**

6. Type of Ownership				
<input checked="" type="checkbox"/> Municipal	<input type="checkbox"/> Commercial	<input type="checkbox"/> Private - Institutional	<input type="checkbox"/> 1 Authority	<input type="checkbox"/> 30 Interstate
<input type="checkbox"/> Industrial	<input type="checkbox"/> 9 Water Works Corp.	<input type="checkbox"/> 26 Board of Education	<input type="checkbox"/> 19 Federal	<input type="checkbox"/> 40 International
			<input type="checkbox"/> 20 State	<input type="checkbox"/> 18 Indian Reservation
7. Estimated Total Cost		8. Population Served		9. Drainage Basin Lower Hudson River
10. Federal Aid Involved?		11. WSA Project?		
<input type="checkbox"/> 1 Yes		<input type="checkbox"/> 1 Yes		
<input checked="" type="checkbox"/> 2 No		<input checked="" type="checkbox"/> 2 No		

**Source**

12.		13. Est. Source Development Cost	
<input type="checkbox"/> Surface	Name _____	Class _____	
<input type="checkbox"/> Ground	Name _____	Class _____	
14. Safe yield GPD		15. Description	

**Treatment**

16 Type of Treatment			
<input type="checkbox"/> 1 Aeration	<input type="checkbox"/> 4 Sedimentation	<input type="checkbox"/> 7 Iron Removal	<input type="checkbox"/> 10 Softening
<input type="checkbox"/> 2 Microstrainers	<input type="checkbox"/> 5 Clarifiers	<input type="checkbox"/> 8 Chlorination	<input type="checkbox"/> 11 Corrosion Control
<input type="checkbox"/> 3 Mixing	<input checked="" type="checkbox"/> 6 Filtration	<input type="checkbox"/> 9 Fluoridation	<input type="checkbox"/> 12 Other
17 Name of Treatment Works Rensselaerville WTP		18 Max. Treatment Capacity 13,500 GPD	
19. Grade of Plant Operator Req.		20. Est. Cost \$14,300	
21. Description Installation of a supplemental GAC filter to reduce precursors to the formation of disinfection byproducts. GAC filter to be installed downstream from existing slow sand filter unit and prior to point of hypochlorite injection.			

**Distribution**

22. Type of Project		23. Type of Storage		24. Est. Distribution Cost	
<input type="checkbox"/> 1 Cross Connection	<input type="checkbox"/> 3 Transmission	Elevated _____	Gals.		
<input type="checkbox"/> 2 Interconnection	<input type="checkbox"/> 4 Fire Pump Cl <sub>2</sub>	Underground _____	Gals.		
25. Anticipated Distribution System Demand: Avg. _____ MGD			MGD (Max)		26. Designed for fire flow?
					<input type="checkbox"/> Yes <input type="checkbox"/> No
27. Description See Item No. 5 Above For Description					

## Approval of Plans for Public Water Supply Improvement

This approval is issued under the provisions of 10 NYCRR, Part 5

1. Applicant Town of Rensselaerville	2. Location of Works (C, V, T) Town of Rensselaerville	3. County Albany	4. Water District Hamlet of Rensselaerville
5. Type of Project			
<input type="checkbox"/> 1 Source <input type="checkbox"/> 3 Pumping Units <input type="checkbox"/> 5 Fluoridation <input type="checkbox"/> 7 Distribution			
<input type="checkbox"/> 2 Transmission <input type="checkbox"/> 4 Chlorination <input checked="" type="checkbox"/> 6 Other Treatment <input type="checkbox"/> 8 Storage			
<input type="checkbox"/> 9 Other			
Remarks: Approved facilities include installation of a 46"x 48"x 32" Filter Tank with GAC media to remove organic compounds. Filter is located downstream from existing slow sand filter and upstream from point of chlorine injection.			

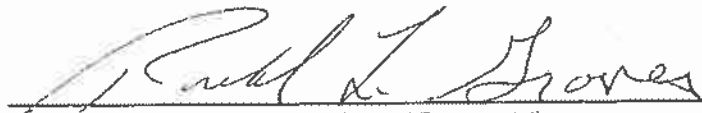
By initiating improvement of the approved supply, the applicant accepts and agrees to abide by and conforms with the following:

- a. THAT the proposed works be constructed in complete conformity with the plans and specifications approved this day or approved amendments thereto.
- b. THAT the proposed works not be placed into operation until such time as a Completed Works Approval is issued in accordance with Part 5 of the New York Sanitary Code.

**See Attached Letter For Conditions C-G**

ISSUED FOR THE STATE COMMISSIONER OF HEALTH

9/15/2021  
Date



Designated Representative  
Ronald L. Groves, P.E., Senior Public Health Engineer  
Division of Environmental Health Services

Name and Title (print)



517 Main Street  
PO Box 1020  
Cairo, NY 12413  
518-622-9667  
518-622-9047 Fax

KAATERSKILL ASSOCIATES

## WATER SYSTEM DESIGN REPORT

FOR

**TOWN of RENSSELAERVILLE**  
PWS ID# 0100202

**TOWN OF RENSSELAERVILLE**  
**ALBANY COUNTY, N.Y.**

ALBANY COUNTY DEPT. OF HEALTH

DATE AUG 31 2021

These plans for ~~the~~ *new* ~~water~~ *water* ~~filtration~~ *filtration* ~~installation~~ *installation*  
**EXAMINED AND APPROVED**

*Robert L. Givens P.E.*



August 6, 2021

KA PROJECT 04220

Revised August 23, 2021

Town of Rensselaerville  
Water System Design Report

Background

The Rensselaerville water treatment facility is a surface water source that uses a slow sand filter system to provide potable water to its customers and fire fighting capability if needed.

The system has been experiencing an increase in the level of Haloacetic Acids (HAAs) over the past few years. Total Trihalomethanes (THMs) were also measured. These are two classes of contaminants that are a result of chlorine interacting with organic compounds, also referred to as disinfection by-products (DBP).

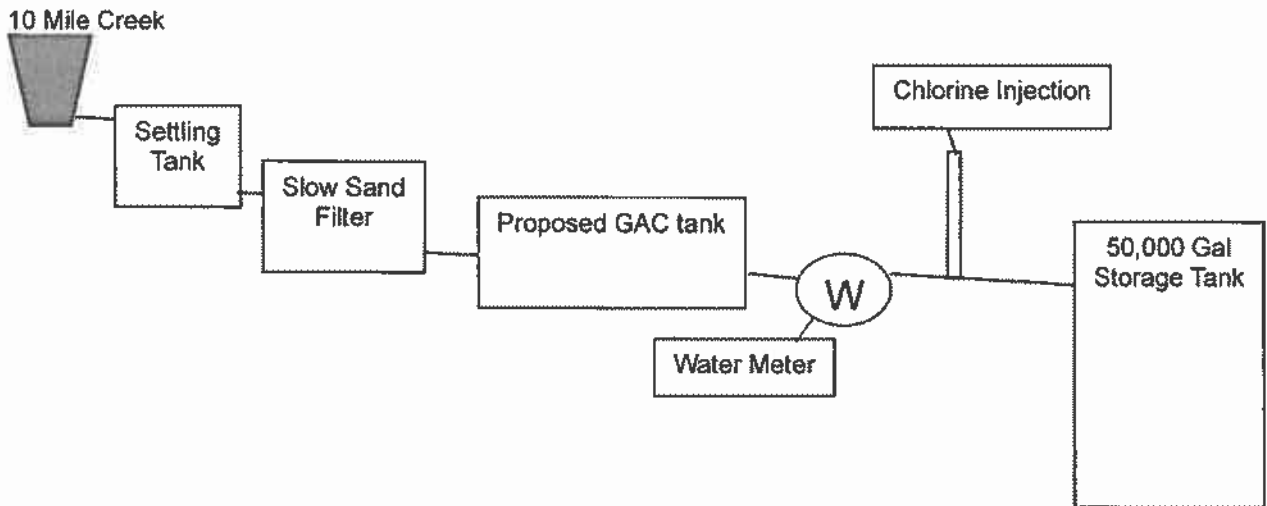
In June of 2017, a layer of Granular Activated Carbon (GAC) was added to the slow sand filter to reduce the organic compounds before coming in contact with the chlorine. This has proved to be difficult to replace as the 6 inch layer of GAC is sandwiched between two 18 inch layers of sand. A separate vessel for the GAC was purchased so that the GAC replacement will be easier and cheaper to perform when the GAC is spent.

This report looks at the proposed system modifications for compliance with the NYS DOH regulations regarding public water systems.

Existing Water Treatment System

Water is taken from the 10 Mile Creek below the Lake Wyosotis dam. The water then passes through a settling chamber to remove large particles and debris. From there the water enters a slow sand filter. In warm months, aeration is used to raise the oxygen level of the water before it passes through the slow sand filter. The water is then disinfected with sodium hypochlorite and stored in a 50,000 gallon water storage tank. The tank is located high enough to provide adequate pressure to the distribution system by gravity alone. The flow rate through the slow sand filter is 10 gpm.

The flow chart below shows the existing system and the proposed modification:





Town of Rensselaerville  
Water System Design Report

Water Quantity

The monthly water reports for the period of June 2020 to May 2021 were reviewed for the maximum and minimum daily flow rates. The maximum daily flow rate was 31,500 gallon per day (gpd) and the minimum daily flow rate was 300 gpd ( there was one reading of zero which was discounted). The average daily flow rate per month varied from 10,420 to 17,058 gpd. The average daily water use for the 12 months of analysis was 13,547 gpd. The chart is in Appendix I.

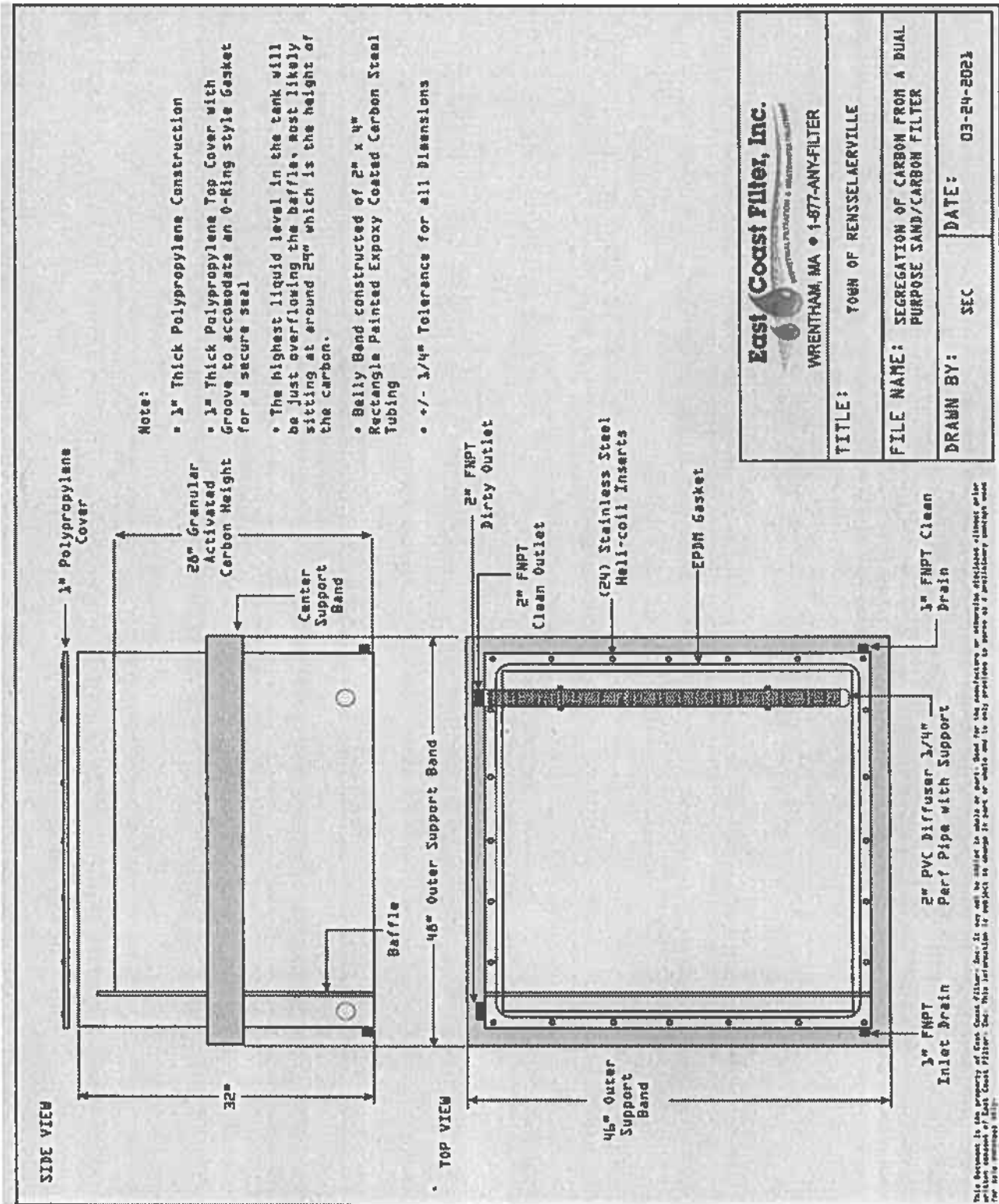
There was a period of higher water use and a search was conducted for possible water leaks. It was determined that two residences had running toilets that accounted for the higher water use.

Proposed System Modifications

The drawing below shows the overall dimensions of the GAC tank. The interior dimensions of the unit that will hold the GAC is: 37.5 inches X 39.5 inches X 28 inches. The 28 inches is the height of carbon in the tank. The size of the tank was determined by the available space within the water treatment room. The tank components are made of polypropylene and the NSF certification is in Appendix II.

The piping is made of schedule 40 PVC pipe with PVC ball valves arranged so that flow from the slow sand filter then enters the GAC filter. Valving and piping is arranged so that the filter can be bypassed. The water will enter the GAC at the top and flow down through the GAC where it will be piped back to the existing piping to the water meter and then receive a dose of sodium hypochlorite before it flows into the 50,000 gallon water storage tank. The NSF certification for the PVC pipe is in Appendix II. The flow rate through the system will be maintained at 10 gpm.

# Town of Rensselaerville Water System Design Report



 <b>East Coast Filter, Inc.</b> <small>WATER TREATMENT &amp; SOLUTIONS INC.</small> WRENTHAM, MA • 1-877-ANY-FILTER	
<b>TITLE:</b>	TOWN OF RENNELAERVILLE
<b>FILE NAME:</b>	SEGREGATION OF CARBON FROM A DUAL PURPOSE SAND/CARBON FILTER
<b>DRAWN BY:</b>	SEC
<b>DATE:</b>	03-24-2021

This document is the property of East Coast Filter, Inc. It may not be copied, altered or used in whole or in part, without the express written consent of East Coast Filter, Inc. This information is subject to change without notice and is only valid for the specific project and date shown. For more information visit:

Town of Rensselaerville  
Water System Design Report

GAC

The GAC that has been purchased is manufactured by the General Carbon Corp. The GAC is a virgin activated carbon made from coconut shells with an 8 X 30 screen grading. The average size of the GAC granules is 2 mm in diameter. The manufacturer's specification sheet is in Appendix II showing NSF compliance.

Analysis

The surface loading rate of the GAC filter is the surface area divided by the flow rate.  $37.5 \text{ in} \times 39.5 \text{ in} / 144 \text{ in}^2 \text{ per square foot} / 10 \text{ gallons per minute} = 1.0 \text{ gallon per minute per square foot}$ .

The volume of the GAC portion of the tank is  $37.5 \text{ in} \times 39.5 \text{ in} \times 28 \text{ in} / 1728 = 24.0 \text{ cubic feet}$ .

The Empty Bed Contact Time (EBCT) for the GAC tank is  $\text{volume/flow rate} = 24 \text{ cubic feet} \times 7.48 \text{ gallons per cubic foot} / 10 \text{ gallons per minute} = 18.0 \text{ min}$

NYCRR 5-1.1:

*(aq) GAC10 means granular activated carbon filter beds with an empty-bed contact time of 10 minutes based on average daily flow and a carbon reactivation or replacement frequency of every 180 days, except that the reactivation frequency for GAC10 used as a best available technology for compliance with total trihalomethanes (TTHM) and haloacetic acids (five) (HAA5) maximum contaminant levels (MCLs) shall be 120 days.*

*(ar) GAC20 means granular activated carbon filter beds with an empty-bed contact time of 20 minutes based on average daily flow and a carbon reactivation frequency of every 240 days.*

The proposed system with an EBCT of 18 minutes does not meet the GAC20 standard and is greater than the GAC10 standard. To meet the GAC10 standard the depth of GAC in the tank would be:

Depth of GAC inches  $= 10 \text{ min} \times 10 \text{ gallons per minute} / 7.48 \text{ gallons per cubic foot} / (37.5 \text{ in} \times 39.5 \text{ in}) \times 1728 \text{ cubic inches per cubic foot} = 15.6 \text{ inches}$  or  $15 \frac{5}{8}$  inches of GAC in tank. The GAC would then have to be changed out every 120 days.

Town of Rensselaerville  
Water System Design Report

Operational Procedures

Typical GAC installations have provisions for the back washing of the GAC to remove particles that have clogged up the pores created by the GAC. This facility has no capability for the disposal of the back washed material. As the filtration rate decreases due to this plugging effect, it is proposed that the upper two inches of GAC be removed and replaced with new GAC. This will require the operator to monitor the flow rate and to make adjustments as necessary.

While the best practices for a GAC10 is to replace the material every 120 days, this procedure does not take into effect the site specific conditions. The ability of GAC to remove organic carbons which are the precursors to HAAs is dependent upon several factors such as pH, temperature, hardness, alkalinity, chlorine residual, contact time, amount of total organic carbon and other contaminants. It is proposed to monitor the HAA readings on a monthly basis for a period of 12 months to determine when the GAC is spent and needs to be replaced. After one year of data, set GAC replacement frequency based on the data. Replacement frequency may vary on a seasonal basis.

GAC replacement should be performed in a wet slurry rather than placing it dry and then allowing the tank to be flooded. This will allow the tank to be put back in service after four hours of soaking rather than 24 hours of soaking if the GAC is placed dry and then flooded. Because there are some fines in the GAC, the filter will be run to waste until the water is clear after replacing the GAC. A one micron filter bag will be used to collect the GAC fines and will be properly disposed of. GAC uses up oxygen in the air when exposed to water. So provide plenty of air circulation in the water treatment room when changing the GAC.

Another operational procedure to reduce the HAA production in the water system is to keep the water level in the water storage tank to a maximum of 5 days of usage. This will reduce the contact time of the chlorine and the organic carbons which produce the HAAs. This has to be balanced with maintaining adequate water in the storage tank for fire fighting capability.

The slow sand filter has a six inch thick layer of GAC. This should be removed and replaced with filter sand which has finer pore spaces and will provide better filtration. The GAC is spent and is no longer removing any organic carbon.

Town of Rensselaerville  
Water System Design Report

APPENDIX I

Water Usage Chart

Town of Rensselaerville  
Water System Design Report

Rensselaerville Water Usage Chart

Month	Year	Max. Daily Flow	Min. Daily Flow	Ave. Daily Flow
June	2020	31,500	9,000	16,587
July	2020	21,000	6,800	13,510
August	2020	28,400	4,800	13,110
September	2020	19,300	(1,900) 0	10,420
October	2020	21,500	300	10,926
November	2020	17,600	1,100	11,253
December	2020	20,500	900	11,494
January	2021	20,100	8,700	13,900
February	2021	23,500	7,500	14,511
March	2021	27,300	300	14,723
April	2021	25,600	4,000	15,070
May	2021	29,300	7,300	17,058

Max. Daily Flow 31,500 gpd

Average Daily Flow 13,547 gpd

Town of Rensselaerville  
Water System Design Report

APPENDIX II

Specification Sheets

Town of Rensselaerville  
Water System Design Report

**CORATEC** CHEMICAL & CORROSION  
RESISTANT MATERIALS

**PROTEC™ PP**

TYPICAL PHYSICAL PROPERTIES	Nominal Value	Units	ASTM Test Method
Melt Index	0.5	g/10 min	D 1238
Density	0.9	g/cm <sup>3</sup>	D 1505
Tensile Strength @ Yield	4,900	psi	D 638
Elongation at Yeild	9.0	%	D 638
Coefficient of Linear Thermal Expansion	6.5x10 <sup>-5</sup>	In./In.° C	D 696
Flexural Modulus	190,000	psi	D 790
Notched Izod Impact @73° F	0.9	ft-lb/in	D 256
Low Temperature Brittleness F <sub>50</sub>			
Heat Deflection Temperature @ 66 psi	210	°F	D 648
Maximum Service Temperature, Air	180		Long Term
Vicat Softening Point	305	°F	D 1525
Hardness, Shore D	78		D 2240
Absorption	Max.01%		D 5709(2)
Flammability Rating	UL94 HB		
Compliances	FDA, USDA, NSF (Natural only)		



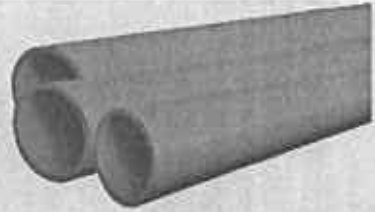
**VYCOM**  
OLEFIN AND PVC SOLUTIONS

801 Cory Street, Scranton, PA 18505  
Phone: 1.800.235.8320  
Fax: 1.800.858.9266  
Website: [www.vycomplastics.com](http://www.vycomplastics.com)

Physical properties of plastic sheeting are represented as "Typical" information contained herein is considered accurate to the best of our knowledge. It is offered for your consideration and investigation, and is not to be construed as a representation or warranty expressed or implied. Our warranties are limited to those expressly stated in formal contracts or in conditions of sale on our invoices and order acceptances. Conditions and methods of use may vary and are beyond the control of Scranton Products; therefore, Scranton Products disclaims any liability incurred as a result of the use of this product in accordance with the data contained in our physical property charts. No information herein shall be construed as an offer of indemnity for infringement or as a recommendation to use the products in such a manner as to infringe any patent, domestic or foreign.

The "Typical" properties of our plastic sheet cannot be automatically used when engineering finished components; and the fabricator or end user is responsible for insuring the suitability of our products for their specific application or end use!

Town of Rensselaerville  
Water System Design Report



## Xirtec® PVC Schedule 40 White Pipe

IPEX offers Schedule 40 solid wall PVC pipe in sizes 1/2" - 24" which can be used in pressure, DWV and well casing applications. IPEX Schedule 40 PVC pipe conforms to industry standards which include ASTM D1785, ASTM D2665, ASTM F480 (2"-16"), ANSI/NSF 14 and ANSI/NSF 61.

SIZE	LENGTHS / LIFT	10' PLAIN END	10' BELL END	20' PLAIN END	20' BELL END
<b>Xirtec® PVC Schedule 40 Pipe</b>					
1/2	280	022600	022603	022602	022601
3/4	225	022633	022604	022677	022607
1	180	022612	022611	022606	022610
1 1/4	165	022608	022674	022678	022617
1 1/2	147	022614	022616	022675	022615
2	98	022618	022619	022679	022620
2 1/2	78	022621	022622	022646	022625
3	65	022637	022624	022623	022630
4	50	022626	022628	022627	022640
5	38	-	-	022651	022650
6	20	022666	022659	022665	022660
8	14	-	-	022681	022680
10	11	-	-	022691	022690
12	8	-	-	022693	022692
14	3	-	-	022682	022694
16	3	-	-	022683	022696
18	3	-	-	022687	022697
20	2	-	-	022702	022698
24	2	-	-	022704	022699

Town of Rensselaerville  
Water System Design Report

**"CLEANING THE WORLD WITH ACTIVATED CARBON"**



**GC 8 X 30S**

coconut shell granular activated carbon

GC 8X30S is a virgin activated carbon, which is granular in form. Made from selected grades of coconut shell, it is ideal for many liquid phase applications including the removal of organics from water streams. Its superior level of hardness makes it cleaner than most other carbons and gives it longer life expectancy. NSF Certified, it is suitable for drinking water and food grade applications.

**Specifications**

Mesh size-8x30, %:	90 (min)
Less than No. 8,%:	5 (max)
Greater than No.30,%:	5 (max)
Iodine Number, mg/g:	1100 (min)
Surface Area, m <sup>2</sup> /g:	1100 (min)
Hardness, %:	98 (min)
Ash Total, %:	4.0 (max)
Moisture, % (as packaged)	5.0 (max)
Typical Density, lbs/cu. ft.:	29-33
g/cc:	0.46-0.53

\*Standard packaging is in 55lb and 1,100lb vinyl bags. Other packaging is available upon request with an additional cost.

**Caution**

Wet activated carbon removes oxygen from air causing a severe hazard to worker inside carbon vessels. Confined space/low oxygen procedures should be put in place before any entry is made. Such procedures should comply with all applicable Local, State and Federal guidelines.

33 Paterson Street Paterson, NJ 07501 Tel: 973-523-2223 Fax: 973-523-1494

[www.generalcarbon.com](http://www.generalcarbon.com)

e-mail: [sales@generalcarbon.com](mailto:sales@generalcarbon.com)

**APPENDIX F**

Public Notice of DOH Violations



DANIEL P. McCOY  
County Executive

ELIZABETH F. WHALEN, MD, MPH  
Commissioner of Health

**DEPARTMENT OF HEALTH**  
COUNTY OF ALBANY  
175 GREEN STREET  
ALBANY, NEW YORK 12202

*The Dr. John J.A. Lyons*  
ALBANY COUNTY HEALTH FACILITY  
(518) 447-4580 FAX (518) 447-4698  
[www.albanycounty.com](http://www.albanycounty.com)

MARIBETH MILLER, BSN, MS  
Assistant Commissioner for Public Health

RANSOM MOORE III  
Assistant Commissioner Finance and Administration

September 15, 2023

Ed Csukas  
87 Barger Road  
Medusa, NY 12120

Re: Rensselaerville WD  
NY0100202  
Maximum Contaminant Level (MCL) Exceedance  
Notice of Violation No. 2023 3279

Dear Mr. Csukas,

This Notice of Violation (NOV) is a result of a sample collected in the monitoring period of 7/01/2023 and 9/30/2023. The locational running annual average (LRAA) concentration exceeds the Maximum Contaminant Level (MCL) for Halo acetic Acids (HAA5s). The MCL for HAA5s is 60 ug/l (micrograms per liter).

The violations are as follows:  
LRAA for HAA5 – 68.9 ug/l

You are required to notify the public within 30 days of receiving this Notice of Violation. The public notification certification form must be completed and returned to this office within 10 days of completion of public notification along with a copy of the distributed notice. Community water systems must include this violation in their 2023 Annual Water Quality Report.

If you have any questions, do not hesitate to contact the Albany County Department of Health at (518) – 447 – 4620.

Sincerely,

Maxwell Ferris, P.E.  
Director  
Division of Environmental Health Services



Albany County Department of Health is nationally accredited and meets rigorous public health standards set forth to best meet the needs of our community.

Loss of pressure in Town of Rensselaerville, Water District No. 1

## **BOIL YOUR WATER BEFORE USING**

**Bring tap water to a rolling boil, boil for one minute, and cool before using.** Or use bottled water certified for sale by the New York State Department of Health. Boiled or bottled water should be used for drinking, making ice, washing dishes, brushing teeth, and preparing food until further notice.

This Boil Water Notice applies to Residents on Methodist Hill Road who are within Water District No. 1

### **What Happened?**

Near 5:00 am on May 25, 2023 – the water system lost pressure due to a break in a pipe which filled the pump vault with water, in turn, shorting out the pump and causing it to fail. When water mains lose pressure, it increases the chance that untreated water and harmful microbes can enter your water.

*Harmful microbes in drinking water can cause diarrhea, cramps, nausea, headaches, or other symptoms and may pose a special health risk for infants, some elderly, and people with severely compromised immune systems. But these symptoms are not just caused by microbes in drinking water. If you experience any of these symptoms and they persist, you should seek medical advice.*

### **What is being done?**

The broken pipe is being repaired and a new pump is being expedited.

It is likely that you will need to boil water until further notice – at least for the next several days. You will be informed when tests show that you no longer need to boil your water.

### **For more information, please contact:**

John Rice, Operator of Rensselaerville Water District No. 1: (518) 810-7219

or the Albany County Department of Health – James Meacham: (518) 447-4620

*Please share this information with other people who drink this water, especially anyone who may not get this notice directly (for example, people in apartments, nursing homes, schools, and businesses).*

*You can do this by posting this notice in a public place or distributing copies by hand or mail.*

## **IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER**

### **Rensselaerville WD Has Levels of Turbidity Above Drinking Water Standards**

Our water system recently violated a drinking water standard. Although this is not an emergency, as our customers, you have a right to know what happened, what you should do, and what we did (are doing) to correct this situation.

We routinely monitor for the presence of drinking water contaminants. On 9/22/22, we received notice that samples collected on 16 days between 8/6/22 & 8/23/22 showed that our system exceeds the standard, or maximum contaminant level (MCL), for turbidity. The standard for turbidity is 1.0 NTU. The average level of turbidity over the last year has been 0.43 NTU.

#### **What should I do?**

- There is nothing you need to do. **You do not need to boil your water** or take other corrective actions. However, if you have specific health concerns, consult your doctor.
- If you have a severely compromised immune system, have an infant, are pregnant, or are elderly, you may be at increased risk and should seek advice from your health care providers about drinking this water.

#### **What does this mean?**

This is not an emergency. If it had been, you would have been notified within 24 hours. Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.

#### **What is being done?**

This is often a seasonal issue and it can resolve on its own. We have added a permanganate dosing pump to treat the raw water coming into the water plant. Also, a fresh charge of granular activated carbon was added to the GAC filter box early September. We anticipate resolving the problem shortly.

For more information, please contact John Rice at 518-810-7219.

*\*Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

This notice is being sent to you by Rensselaerville Water District.

State Water System ID#: 100202.

Date distributed: 10/24/2022

## **IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER**

### **Total Trihalomethanes (TTHM) & Haloacetic Acid 5 (HAA5) Violation at Rensselaerville Water District No. 1**

Our water system recently violated a drinking water standard. Although this incident was not an emergency, as our customers, you have a right to know what happened and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Testing results from May 2021 to May 2022 show that our system exceeds the standard, or maximum contaminant level (MCL), for TTHM and HAA5. The standard for TTHM is  $\leq 80$  ug/L and for HAA5 is  $\leq 60$  ug/L. It is determined by averaging all the samples collected for the past 12 months. The level of TTHM & HAA5 averaged for May 2021 to May 2022 was 102.61 ug/L and 122.49 ug/L respectively. May 5, 2022 sample results were TTHM: 122 ug/L and HAA5: 44.9 ug/L.

#### **What should I do?**

- There is nothing you need to do. You do not need to boil your water or take other corrective actions. If a situation arises where the water is no longer safe to drink, you will be notified within 24 hours.
- If you have a severely compromised immune system, have an infant, are pregnant, or are elderly, you may be at increased risk and should seek advice from your health care providers about drinking this water.

#### **What does this mean?**

This is not an emergency. If it had been an emergency, you would have been notified within 24 hours.

#### **TRIHALOMETHANES**

Trihalomethanes are a group of chemicals that are formed in drinking water during disinfection when chlorine reacts with naturally occurring organic material (e.g., decomposing vegetation such as tree leaves, algae or other aquatic plants) in surface water sources such as rivers and lakes. They are disinfection byproducts and include the individual chemicals chloroform, bromoform, bromodichloromethane, and chlorodibromomethane. The amount of trihalomethanes formed in drinking water during disinfection can change from day to day, depending on the temperature, the amount of organic material in the water, the amount of chlorine added, and a variety of other factors.

Disinfection of drinking water by chlorination is beneficial to public health. Drinking water is disinfected by public water suppliers to kill bacteria and viruses that could cause serious illnesses, and chlorine is the most commonly used disinfectant in New York State. All public water systems that use chlorine as a disinfectant contain trihalomethanes to some degree.

Some studies suggest that people who drank water containing trihalomethanes for long periods of time (e.g., 20 to 30 years) have an increased risk of certain health effects. These include an increased risk for cancer and for low birth weights, miscarriages and birth defects. The methods used by these studies could not rule out the role of other factors that could have resulted in the observed increased risks. In addition, other similar studies do not show an increased risk for these health effects. Therefore, the evidence from these studies is not strong enough to conclude that trihalomethanes were a major factor contributing to the observed increased risks for these health effects. Studies of laboratory animals show that some trihalomethanes can cause cancer and adverse reproductive and developmental effects, but at exposures much higher than exposures that could result through normal use of the water. The United States Environmental Protection Agency reviewed the information from the human and animal studies and concluded that while there is no causal link between disinfection byproducts

(including trihalomethanes) and human health effects, the balance of the information warranted stronger regulations that limit the amount of trihalomethanes in drinking water, while still allowing for adequate disinfection. The risks for adverse health effects from trihalomethanes in drinking water are small compared to the risks for illness from drinking inadequately disinfected water. (3/2016)

### **HALOACETIC ACIDS**

Haloacetic acids are disinfection byproducts formed during treatment of drinking water by chlorine, the most commonly used disinfectant in New York State. Drinking water is disinfected by public water suppliers to kill bacteria and viruses that could cause serious illnesses. For this reason, disinfection of drinking water by chlorination is beneficial to public health. The amount of haloacetic acids in drinking water can change from day to day, depending on the temperature, the amount of organic material in the source water, the amount of chlorine added, and a variety of other factors.

The following paragraph summarizes and characterizes the available studies on human populations exposed to haloacetic acids, and provides a general summary of the health effects of haloacetic acids in animals, which occur at exposure levels much higher than exposures that could result through normal use of the water.

Some studies suggest that people who drank chlorinated drinking water containing disinfection by-products (including haloacetic acids) for long periods of time (e.g., 20 to 30 years) have an increased risk for cancer. However, how long and how frequently people actually drank the water, and how much haloacetic acids the water contained is not known for certain. Therefore, the evidence from these studies is not strong enough to conclude that the observed increased risk for cancer is due to haloacetic acids, other disinfection by-products, or some other factor. Studies of laboratory animals show that the two haloacetic acids, dichloroacetic acid and trichloroacetic acid, can cause cancer following exposure to high levels over their lifetimes. Dichloroacetic acid and trichloroacetic acid are also known to cause other effects in laboratory animals after high levels of exposure, primarily on the liver, kidney, and nervous system and on their ability to bear healthy offspring. The risks for adverse health effects from haloacetic acids in drinking water are small compared to the risk for illness from drinking inadequately disinfected water. (10/2018)

### **What is being done?**

The Albany County Department of Health conducted a survey of the Rensselaerville Water System and has made some recommendations. One of those recommendations was to remove a beaver dam located upstream of the water plant intake. After receiving permission from the NYS Department of Environmental Conservation, the dam has been removed. The DOH also recommended regular flushing of the hydrants to help lessen post-treatment formation of disinfection by-products in the system's water mains. Also, with guidance from an engineering firm, modifications are being planned that would improve the quality of raw water entering the system, and thus lessening the burden on the filtration plant and improving overall water quality.

For more information, please contact Water Operator John Rice at (518) 810-7219 or email: [kenlodge@hotmail.com](mailto:kenlodge@hotmail.com).

This notice is being sent to you by the Town of Rensselaerville Water District No. 1.  
State Water System ID#: 100202  
Date distributed: 07/08/2022

## **IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER**

### **Total Trihalomethanes (TTHM) & Haloacetic Acid 5 (HAA5) Violation at Rensselaerville Water District No. 1**

Our water system recently violated a drinking water standard. Although this incident was not an emergency, as our customers, you have a right to know what happened and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Testing results from February 2021 to February 2022 show that our system exceeds the standard, or maximum contaminant level (MCL), for TTHM and HAA5. The standard for TTHM is  $\leq 80$  ug/L and for HAA5 is  $\leq 60$  ug/L. It is determined by averaging all the samples collected for the past 12 months. The level of TTHM & HAA5 averaged for February 2021 to February 2022 was 103 ug/L and 126 ug/L respectively. February 2, 2022 sample results were TTHM: 93.4 ug/L and HAA5: 77.2 ug/L.

#### **What should I do?**

- There is nothing you need to do. You do not need to boil your water or take other corrective actions. If a situation arises where the water is no longer safe to drink, you will be notified within 24 hours.
- If you have a severely compromised immune system, have an infant, are pregnant, or are elderly, you may be at increased risk and should seek advice from your health care providers about drinking this water.

#### **What does this mean?**

This is not an emergency. If it had been an emergency, you would have been notified within 24 hours.

#### **TRICHALOMETHANES**

Trihalomethanes are a group of chemicals that are formed in drinking water during disinfection when chlorine reacts with naturally occurring organic material (e.g., decomposing vegetation such as tree leaves, algae or other aquatic plants) in surface water sources such as rivers and lakes. They are disinfection byproducts and include the individual chemicals chloroform, bromoform, bromodichloromethane, and chlorodibromomethane. The amount of trihalomethanes formed in drinking water during disinfection can change from day to day, depending on the temperature, the amount of organic material in the water, the amount of chlorine added, and a variety of other factors.

Disinfection of drinking water by chlorination is beneficial to public health. Drinking water is disinfected by public water suppliers to kill bacteria and viruses that could cause serious illnesses, and chlorine is the most commonly used disinfectant in New York State. All public water systems that use chlorine as a disinfectant contain trihalomethanes to some degree.

Some studies suggest that people who drank water containing trihalomethanes for long periods of time (e.g., 20 to 30 years) have an increased risk of certain health effects. These include an increased risk for cancer and for low birth weights, miscarriages and birth defects. The methods used by these studies could not rule out the role of other factors that could have resulted in the observed increased risks. In addition, other similar studies do not show an increased risk for these health effects. Therefore, the evidence from these studies is not strong enough to conclude that trihalomethanes were a major factor contributing to the observed increased risks for these health effects. Studies of laboratory animals show that some trihalomethanes can cause cancer and adverse reproductive and developmental effects, but at exposures much higher than exposures that

could result through normal use of the water. The United States Environmental Protection Agency reviewed the information from the human and animal studies and concluded that while there is no causal link between disinfection byproducts (including trihalomethanes) and human health effects, the balance of the information warranted stronger regulations that limit the amount of trihalomethanes in drinking water, while still allowing for adequate disinfection. The risks for adverse health effects from trihalomethanes in drinking water are small compared to the risks for illness from drinking inadequately disinfected water. (3/2016)

### **HALOACETIC ACIDS**

Haloacetic acids are disinfection byproducts formed during treatment of drinking water by chlorine, the most commonly used disinfectant in New York State. Drinking water is disinfected by public water suppliers to kill bacteria and viruses that could cause serious illnesses. For this reason, disinfection of drinking water by chlorination is beneficial to public health. The amount of haloacetic acids in drinking water can change from day to day, depending on the temperature, the amount of organic material in the source water, the amount of chlorine added, and a variety of other factors.

The following paragraph summarizes and characterizes the available studies on human populations exposed to haloacetic acids, and provides a general summary of the health effects of haloacetic acids in animals, which occur at exposure levels much higher than exposures that could result through normal use of the water.

Some studies suggest that people who drank chlorinated drinking water containing disinfection byproducts (including haloacetic acids) for long periods of time (e.g., 20 to 30 years) have an increased risk for cancer. However, how long and how frequently people actually drank the water, and how much haloacetic acids the water contained is not known for certain. Therefore, the evidence from these studies is not strong enough to conclude that the observed increased risk for cancer is due to haloacetic acids, other disinfection by-products, or some other factor. Studies of laboratory animals show that the two haloacetic acids, dichloroacetic acid and trichloroacetic acid, can cause cancer following exposure to high levels over their lifetimes. Dichloroacetic acid and trichloroacetic acid are also known to cause other effects in laboratory animals after high levels of exposure, primarily on the liver, kidney, and nervous system and on their ability to bear healthy offspring. The risks for adverse health effects from haloacetic acids in drinking water are small compared to the risk for illness from drinking inadequately disinfected water. (10/2018)

### **What is being done?**

The granular activated carbon filter was refreshed with new carbon on March 3<sup>rd</sup>. On the basis of analyses of both our raw and finished water, done by an independent laboratory, our GAC filter design firm, East Coast Filter, is recommending that we try changing the type of Granular Activated Carbon used in our filter to one based on materials different than the carbon we have used in the past. This may be done after one more sets of tests are performed using the recently installed carbon to see if we have succeeded in further reducing DBP levels to within recommended ranges.

For more information, please contact Water Operator John Rice at (518) 810-7219 or email: kenlodge@hotmail.com.

This notice is being sent to you by the Town of Rensselaerville Water District No. 1.  
State Water System ID#: 100202  
Date distributed: 03/09/2022

APPENDIX F

DETAILED OPINION OF PROBABLE COST

Rensselaerville Water District Improvements Project					
Opinion of Probable Cost					
Alternative 1 - Groundwater Source (Albany Hill Road)					
Item	Quantity	Unit	Unit Price	Total Price	Notes
<b>Well Field Site - Albany Hill Road</b>					
Mobilization/Demobilization, General Conditions, Site Preparation	1	LS	\$ 65,000.00	\$ 65,000.00	
Water Well Drilling	3	EA	\$ 29,700.00	\$ 89,100.00	(2 Production Supply,1 Backup); 250' Drill/Install/Step Test/72-hours Test
Road Access to Drilling Locations	1	LS	\$ 20,000.00	\$ 20,000.00	
Submersible Well Pump	3	EA	\$ 11,000.00	\$ 33,000.00	3 hp, 20 GPM equivalent
Chlorination/Metering Building	1	EA	\$ 200,000.00	\$ 200,000.00	Assume pre-cast sodium hypo w/meter
Pressure Contact Tank	5	EA	\$ 2,000.00	\$ 10,000.00	5, 120 gallon contact tanks
Emergency Generator	1	EA	\$ 85,000.00	\$ 85,000.00	Diesel, 15 kW, 3 Phase. Includes cost of equipment (including ATS), installation and commissioning
Site Piping	275	LF	\$ 60.00	\$ 16,500.00	
Site Work	4000	SF	\$ 45.00	\$ 180,000.00	
Purchase of Land	1	LS	\$ 35,349.00	\$ 35,349.00	2024 Tentative Full Market Value
<b>Distribution System - Albany Hill Road/County Route 361</b>					
8" HDPE tie into existing Distribution System	1110	LF	\$ 90.00	\$ 99,900.00	Albany County Road, County Generally Requires Directional Drill
8" Gate Valve	2	EA	\$ 7,500.00	\$ 15,000.00	
8" Tee, Connect to Existing Main	1	EA	\$ 20,000.00	\$ 20,000.00	
Hydrant Assembly	3	EA	\$ 11,500.00	\$ 34,500.00	
Water Services	4	EA	\$ 5,000.00	\$ 20,000.00	Assume re-connection to existing properties on Albany Hill Road
General Conditions, Restoration, Test Pits, Traffic Control, etc.	1	LS	\$ 75,760.00	\$ 75,760.00	40% of Water Main Installation Cost
<b>Existing WTP Site - Rice Road</b>					
Mobilization/Demobilization, General Conditions, Site Preparation	1	LS	\$ 5,000.00	\$ 5,000.00	
Demolition - Chemical Feed Building	1	LS	\$ 7,500.00	\$ 7,500.00	
Demolition - Sedimentation Chamber	1	LS	\$ 4,000.00	\$ 4,000.00	
Demolition - Slow Sand Filter	1	LS	\$ 3,000.00	\$ 3,000.00	
Site Restoration	1	LS	\$ 15,000.00	\$ 15,000.00	
Subtotal				\$ 1,033,609.00	
Contingency (30%)				\$ 186,049.62	
Construction Total				\$ 1,219,658.62	
<b>Non-Construction Costs</b>					
Hydrogeological Services				\$ 127,950.00	Well Design, Plans & Specifications, Construction and Post-Construction Phase Hydrogeo Services, Analytical Laboratory, Survey
Engineering, Legal, Construction Administration (20%)				\$ 243,931.72	
Non-Construction Subtotal				\$ 371,881.72	
Total 2024 Construction Costs				\$ 1,591,540.34	

Rensselaerville Water District Improvements Project					
Opinion of Probable Cost					
Alternative 2 - Surface Water Source (Ten Mile Creek)					
Item	Quantity	Unit	Unit Price	Total Price	Notes
<b>Existing WTP Site - Rice Road</b>					
Water Treatment Filter and Disinfection Building	800	SF	\$ 400.00	\$ 320,000.00	
Membrane Filtration System	1	EA	\$ 1,350,000.00	\$ 1,350,000.00	Redundant (N+1) Aria Membrane Filtration System
Membrane Filtration System - Shipping	1	LS	\$ 25,000.00	\$ 25,000.00	
Chemical Feed Dosing Pump	3	EA	\$ 1,500.00	\$ 4,500.00	
Chemical Feed Storage	3	EA	\$ 500.00	\$ 1,500.00	
Water Meter	1	EA	\$ 400.00	\$ 400.00	
Backup Generator	1	EA	\$ 85,000.00	\$ 85,000.00	Diesel, 15 kW, 3 Phase. Includes cost of equipment (including ATS), installation and commissioning
Site Work	4000	SF	\$ 45.00	\$ 180,000.00	
Mobilization/Demobilization, General Conditions, Site Preparation	1	LS	\$ 150,000.00	\$ 150,000.00	
Demolition - Chemical Feed Building	1	LS	\$ 7,500.00	\$ 7,500.00	
Demolition - Sedimentation Chamber	1	LS	\$ 4,000.00	\$ 4,000.00	
Demolition - Slow Sand Filter	1	LS	\$ 3,000.00	\$ 3,000.00	
Site Restoration	1	LS	\$ 15,000.00	\$ 15,000.00	
<b>Sanitary Sewer Extension - Pond Hill Road to WTP</b>					
Mobilization/Demobilization, General Conditions, Site Preparation	1	LS	\$ 15,000.00	\$ 15,000.00	
Extension of Sanitary Sewer - 8" PVC SDR 26	600	LF	\$ 168.00	\$ 100,800.00	
4' Precast Concrete Sanitary Sewer Manhole	3	EA	\$ 6,800.00	\$ 20,400.00	
Sanitary Sewer Service Lateral - 4" PVS SDR 26	1	EA	\$ 1,500.00	\$ 1,500.00	
Subtotal				\$ 2,283,600.00	
Contingency (30%)				\$ 411,048.00	
Construction Total				\$ 2,694,648.00	
Engineering, Legal, Construction Administration (20%)				\$ 538,929.60	
Total 2024 Construction Costs				\$ 3,233,577.60	

Opinion of Probable Cost					
Alternative 2A - Surface Water Source (Lake Myosotis)					
Item	Quantity	Units	Unit Price	Cost	Notes
<b>Existing WTP Site - Rice Road</b>					
Extension of 6" DIP Raw Water Intake up to Lake Myosotis Dam	2375	LF	\$ 125.00	\$ 296,875.00	
Raw Water Intake into Lake Myosotis	1	LS	\$ 500,000.00	\$ 500,000.00	
Mobilization/Demobilization, General Conditions, Site Preparation	1	LS	\$ 80,000.00	\$ 80,000.00	
Subtotal				\$ 876,875.00	
Contingency (30%)				\$ 157,837.50	
Construction Total				\$ 1,034,712.50	
Engineering, Legal, Construction Administration (20%)				\$ 206,942.50	
Total 2024 Construction Costs				\$ 1,241,655.00	

Rensselaerville Water District Improvements Project					
Opinion of Probable Cost					
Alternative 3 - Private Individual Wells					
Item	Quantity	Unit	Unit Price	Total Price	Notes
<b>Existing WTP Site - Rice Road</b>					
Mobilization/Demobilization, General Conditions, Site Preparati	1	LS	\$ 5,000.00	\$ 5,000.00	
Demolition - Chemical Feed Building	1	LS	\$ 7,500.00	\$ 7,500.00	
Demolition - Sedimentation Chamber	1	LS	\$ 4,000.00	\$ 4,000.00	
Demolition - Slow Sand Filter	1	LS	\$ 3,000.00	\$ 3,000.00	
Site Restoration	1	LS	\$ 15,000.00	\$ 15,000.00	
<b>Distribution System</b>					
Mobilization/Demobilization, General Conditions, Site Preparati	1	LS	\$ 115,000.00	\$ 115,000.00	
Demolition - Existing Hydrant and Valve Assemblies	27	EA	\$ 1,500.00	\$ 40,500.00	Removal or abandon in place? 8" + 6" DIP, 14 Hydrant Assemblies, valves, etc
Installation - Private Well and Pump	79	EA	\$ 10,000.00	\$ 790,000.00	Mobilization, drill/install cased 6-inch bedrock well (200' deep w/ 2hp submersible pump) w/ 4 hr yield test. Objective: yield of 5 gpm
Installation - Site Piping	79	EA	\$ 2,500.00	\$ 197,500.00	
Site Restoration	79	EA	\$ 1,500.00	\$ 118,500.00	
<b>464 Albany Hill Road</b>					
Extension of Sanitary Sewer along AHR - 8" PVC SDR 26	400	LF	\$ 168.00	\$ 67,200.00	
4' Precast Concrete Sanitary Sewer Manhole	2	EA	\$ 6,800.00	\$ 13,600.00	
Sanitary Sewer Service Lateral - 4" PVS SDR 26	1	EA	\$ 1,500.00	\$ 1,500.00	
Decommissioning Existing Septic System	1	EA	\$ 5,000.00	\$ 5,000.00	
Mobilization/Demobilization, General Conditions, Site Preparati	1	LS	\$ 7,500.00	\$ 7,500.00	Includes County Road Traffic Control
Subtotal				\$ 1,390,800.00	
Contingency (30%)				\$ 250,344.00	
Construction Total				\$ 1,641,144.00	
<b>Non-Construction Costs</b>					
Engineering, Legal	79	EA	\$ 2,000.00	\$ 158,000.00	
Analytical Laboratory Services	79	EA	\$ 1,000.00	\$ 79,000.00	Part V Analysis
Total 2024 Construction Costs				\$ 1,878,144.00	

Rensselaerville Water District Improvements Project					
Opinion of Probable Cost					
Alternative 1 - Welded Carbon Steel Ground Water Storage Tank					
Item	Quantity	Units	Unit Price	Cost	Notes
<b>Existing WTP Site - Rice Road</b>					
New 60,000 Gallon Ground Storage Tank	1	LS	\$ 275,000.00	\$ 275,000.00	Welded Carbon Steel; 26'-Dia, 16'-H
Tank Mixer	1	LS	\$ 20,000.00	\$ 20,000.00	
Mobilization/Demobilization, General Conditions, Site Preparation	1	LS	\$ 50,000.00	\$ 50,000.00	
Environmental Controls	1	LS	\$ 5,000.00	\$ 5,000.00	
Earthwork Grading	100	CY	\$ 25.00	\$ 2,500.00	
Fine Grade Tank Subbase	20	CY	\$ 18.00	\$ 360.00	
Concrete Foundation and Slab	55	CY	\$ 400.00	\$ 22,000.00	Complete with forms and rebar
Tank Grade Base Leveling / Shim	550	SF	\$ 22.00	\$ 12,100.00	
Site Work - Tank Spill Area	300	SF	\$ 45.00	\$ 13,500.00	
Site Restoration	1	LS	\$ 7,500.00	\$ 7,500.00	
Subsurface Investigation	1	LS	\$ 15,000.00	\$ 15,000.00	2 Test borings (1-50' deep,1-25' deep)
Fencing	300	LF	\$ 55.00	\$ 16,500.00	300 LF = current parcel perimeter
Demolition - Existing Buried Water Storage Tank at Rice Road	1	LS	\$ 12,000.00	\$ 12,000.00	50,000 Gal. Concrete Tank
Backup Generator	1	EA	\$ 15,000.00	\$ 15,000.00	Gasoline, 3 Phase, 11.5 kW
Subtotal				\$ 466,460.00	
Contingency (30%)				\$ 83,962.80	
Construction Total				\$ 550,422.80	
Engineering, Legal, Construction Administration (20%)				\$ 110,084.56	
Total 2024 Construction Costs				\$ 660,507.36	

Rensselaerville Water District Improvements Project					
Opinion of Probable Cost					
Alternative 2 - Cast-in-place Concrete Buried Water Storage Tank					
Item	Quantity	Units	Unit Price	Cost	Notes
<b>Existing WTP Site - Rice Road</b>					
Tank Mixer	1	LS	\$ 20,000.00	\$ 20,000.00	
Mobilization/Demobilization, General Conditions, Site Preparation	1	LS	\$ 50,000.00	\$ 50,000.00	
Environmental Controls	1	LS	\$ 5,000.00	\$ 5,000.00	
Earthwork Grading	100	CY	\$ 25.00	\$ 2,500.00	
Excavation	430	CY	\$ 42.00	\$ 18,060.00	Fill to be reused for demo of existing tank
Rock Excavation	200	CY	\$ 125.00	\$ 25,000.00	Rock depth dependent of Geotechnical Investigation
Fine Grade Tank Subbase	30	CY	\$ 18.00	\$ 540.00	
Concrete Foundation and Slab	40	CY	\$ 400.00	\$ 16,000.00	Complete with forms and rebar
Formwork/Rebar	950	SD	\$ 185.00	\$ 175,750.00	
Concrete	55	CY	\$ 675.00	\$ 37,125.00	Pour and form removal
Lining - Treated Fluid Resilience w/ curing	1650	SF	\$ 55.00	\$ 90,750.00	
Manway	1	EA	\$ 12,500.00	\$ 12,500.00	
Concrete Tank Cap	710	SF	\$ 55.00	\$ 39,050.00	
Site Restoration	1	LS	\$ 850.00	\$ 850.00	
Subsurface Investigation	1	LS	\$ 11,000.00	\$ 11,000.00	2 Test borings (1-50' deep,1-25' deep)
Fencing	300	LF	\$ 55.00	\$ 16,500.00	300 LF = current parcel perimeter
Demolition - Existing Buried Water Storage Tank at Rice Road	1	LS	\$ 12,000.00	\$ 12,000.00	Removal of top 30", Abandon remaining in place, bury with excavated fill and compact
Backup Generator	1	EA	\$ 15,000.00	\$ 15,000.00	Gasoline Operated, 3 Phase, 11.5 kW
Subtotal				\$ 547,625.00	
Contingency (30%)				\$ 98,572.50	
Construction Total				\$ 646,197.50	
Engineering, Legal, Construction Administration (20%)				\$ 129,239.50	
Total 2024 Construction Costs				\$ 775,437.00	

Rensselaerville Water District Improvements Project					
Opinion of Probable Cost					
Pump Station - Methodist Hill Road					
Item	Quantity	Units	Unit Price	Cost	Notes
<b>Pump Station - Methodist Hill Road</b>					
Integrated Variable Speed Constant Pressure System	1	EA	\$ 3,510.00	\$ 3,510.00	1AB31HME06, Pump and Pressure Tank combo
Piping	1	LS	\$ 500.00	\$ 500.00	
Pump Vault	1	EA	\$ 35,000.00	\$ 35,000.00	includes excavation & backfill
Demolition - Existing Pump Station	1	LS	\$ 5,000.00	\$ 5,000.00	
Mobilization/Demobilization, General Conditions, Site Preparation	1	LS	\$ 5,000.00	\$ 5,000.00	
Subtotal				\$ 49,010.00	
Contingency (30%)				\$ 8,821.80	
Construction Total				\$ 57,831.80	
Engineering, Legal, Construction Administration (20%)				\$ 11,566.36	
Total 2024 Construction Costs				\$ 69,398.16	

## APPENDIX G

### PALL CORPORATION MEMBRANE FILTRATION SYSTEM



Pall Corporation

Pall Aria™  
AP Series  
Packaged  
Water  
Treatment  
Systems



*Filtration. Separation. Solution.™*

# Pall Aria™ AP Series Packaged Water Treatment Systems

## Installations

Point Hope, AK

Wainwright, AK

Nuiqsut, AK

Point Lay, AK

Atkasuk, AK

Anchorage, AK

Kaktuvik, AK

Kernville, CA

Burbank, CA

## Membrane Filtration for Safe Drinking Water

Pall Aria™ AP water treatment systems are specifically designed to produce drinking water that meets today's stringent standards. The systems use uniquely designed filtration modules in a hollow fiber configuration to remove the following contaminants from surface and ground water sources.

- Suspended solids/turbidity
- Viruses
- Bacteria
- Cysts and oocysts
- Iron and manganese
- Arsenic
- Organics


The Microza<sup>1</sup> hollow fiber membranes are highly permeable, resulting in high water production rates. Each hollow fiber module provides high active surface area of up to 538 ft<sup>2</sup>. Pall's dedication to a simplified process and control design has produced a family of systems that are characterized by:

- Tough, hollow fiber membranes with long service life
- Operator-friendly controls
- Simple surface water treatment without coagulation
- Unique air scrub and flush operation
- High efficiency and low waste
- Excellent compatibility with chlorine and common treatment chemicals
- Minimal cost of operation
- Easy installation using modular skids
- Compact system footprint
- Full system NSF 61 listing
- ISO 9001 certified manufacturing
- ETV certified for surface water treatment rule

Site testing confirmed Pall Aria AP systems meet or exceed US EPA standards for safe drinking water. The system is also the first to receive 'full system' certification in accordance with ANSI/NSF 61 specifications.

<sup>1</sup> Microza is a registered trademark of Asahi Kasei Corp., Ltd.





Membrane filtration is a pressure driven process that uses a semipermeable (porous) membrane to separate particulate matter from soluble components in the carrier fluid, such as water. In Pall Aria AP systems, microfiltration or ultrafiltration membranes act much like a very fine sieve to retain particulate matter, while water and its soluble components pass through the membrane as filtrate, or filtered water. The retained solids are concentrated in a waste stream that is discharged from the membrane system. The pore size of the membrane and the integrity of the sealing mechanism controls the fraction of the particulate matter that is removed. Microza membranes, with their fine pore size and absolute seal, remove virtually all of the fine matter, such as silica, bacteria, and parasite cysts.



# Pall Aria AP Systems - Overview

## Installations

Forestville, CA

Avon, CO

Pinellas Park, FL

Hobart, NY

Youngs River, OR

Beverly Beach Park, OR

Bullards Beach, OR

Astoria, OR

Hite Marina, UT

## Transforming Water from Any Source to Match Your Requirements

Pall Aria AP water treatment systems are used to filter ground and surface waters for drinking water supply and industrial uses, and secondary wastewater effluent for reuse.

### Ground Water

- Lowers turbidity and removes microbial pathogens from ground water under the influence of surface water.
- Removes iron and manganese with oxidation.
- Removes arsenic with coagulation.

### Surface Water

- Lowers turbidity and removes microbial pathogens from raw water drawn from rivers, streams, lakes, and reservoirs.
- Removes organics with coagulation to improve disinfection by-products rule compliance, taste, and odor.

### Secondary Wastewater Effluent

- Removes suspended solids and reduces SDI prior to RO treatment for reuse.
- Removes bacteria and other pathogens and suspended solids to produce water suitable for landscape irrigation and similar reuse applications.

## Pall Membrane Microbial and Particulate Removal

Contaminants	Typical Removal <sup>2</sup>	
	Microfiltration (MF)	Ultrafiltration (UF)
Giardia	>6 log	>6 log
Cryptosporidium	>6 log	>6 log
MS2 Coliphage or bacteriophage	0.5 – 2.5 log <sup>3</sup>	4.5 – 6 log <sup>3</sup>
Turbidity	<0.1 ntu	<0.1 ntu

<sup>2</sup> Based on third party testing.

<sup>3</sup> Virus removal varies depending on coagulation process upstream of system.



# Pall Aria AP Systems - Specifications

## Packaged for Fast, Easy Installation

Pall Aria AP water treatment systems are highly flexible production-scale membrane filtration packages, designed to filter a wide range of feed streams. Standard systems are available in the following skid-mounted configurations.

## Standard System Specifications

Model Number	Maximum Number of Modules	Filtered Water Capacity (gpm [m <sup>3</sup> /hr])	Dimensions (L x W x H : ft [m])	
			Shipped <sup>4</sup>	Installed
AP-1	2	3-25 [0.7-5.7]	6.1 x 2.8 x 6.5 [1.9 x 0.9 x 2.0]	6 x 2.8 x 9.8 <sup>7</sup>
AP-2	8	10-50 [2.3-11.4]	8.1 x 2.8 x 6.5 [2.5 x 0.9 x 2.0]	8 x 4.1 x 9.9 <sup>7</sup>
AP-3	10	25-150 [5.7-34.1]	8.2 x 5.7 x 7.5 [2.5 x 1.7 x 2.3]	9.5 x 6.9 x 10.3 <sup>7</sup>
AP-3x	20	25-150 [5.7-34.1]	8.2 x 5.7 x 7.5 [2.5 x 1.7 x 2.3] <sup>5,6</sup>	8.8 x 18.6 x 10.8 <sup>5</sup>
AP-4	36	50-350 [11.4-79.5]	10 x 6.8 x 7.7 [3 x 2.1 x 2.3] <sup>5,6</sup>	10.8 x 20.8 x 10.8 <sup>5</sup>
AP-6	60	200-850 [45.4-193.2]	10 x 6 x 6.8 [3 x 1.8 x 2.1] <sup>5,6,8</sup>	19.1 x 17 x 10.8 <sup>5,8</sup>

<sup>4</sup> Crating: Add 0.5 ft [0.15 m] to each dimension. <sup>7</sup> Control skid with attached module rack.

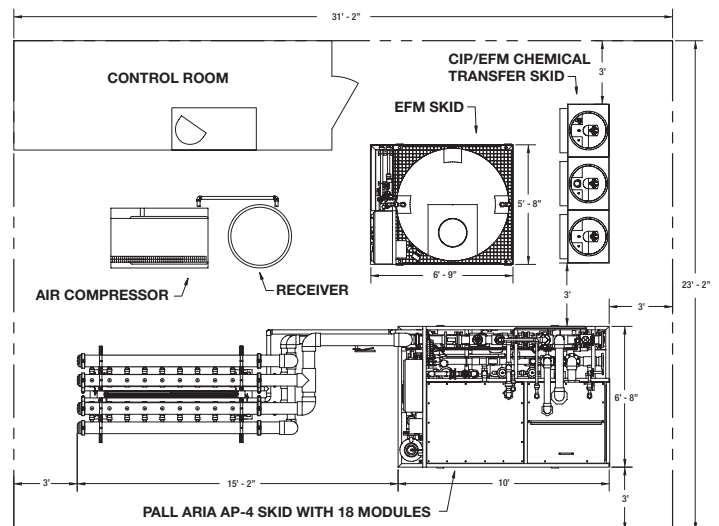
<sup>5</sup> Module rack is off the skid.

<sup>6</sup> Module rack shipped as crated parts kit.

<sup>8</sup> Two freestanding tanks 5'6" W x 7'6" H, shipped separately for each skid.

## Optional and Auxiliary Equipment

- Modem for remote access
- Auto dialer for alarms
- PC for operator interface terminal and data acquisition
- Feed or filtrate turbidimeters
- Oxidant dosing systems
- Air compressor systems
- Enhanced Flux Maintenance (EFM) systems to reduce system costs
- Disinfectant dosing systems
- Coagulant and clean-in-place (CIP) chemical
- Storage dosing systems
- Filtrate particle counter



Typical treatment plant layout for 500,000 gallons per day

Auxiliary equipment to improve treatment capabilities is available on separate skids, which are equipped with distributed controls that can be integrated into a master control system to provide optimal, automatic integrated system operation.

## Installations

Basalt, UT

Lake Powell UT

Stoney Creek, VA

Ashford, WA

Meeteetse, WY

Point of Rocks, WY

Manati, Puerto Rico

Burleigh Falls, Canada

Bruce Mines, Canada

Panel Ray, Mexico

## Standard Components

A standard Pall Aria AP packaged system consists of 1 to 60 membrane modules, one feed/CIP tank and pump, one reverse filtration tank and pump, manual and automatic valves, flow meter, pressure and temperature sensors, PLC control, control panel, and a painted carbon steel frame. Other items can be added on request. Separate auxiliary skids are available for compressed air and chemical feed/pre-oxidation.

- Painted carbon steel frame
- 316 SST pumps with TEFC motors and VFDs
- PVC and stainless steel piping
- Butterfly valves (manual and air operated)
- PE tanks with level control
- PLC controls and software
- Instrumentation (digital and 4-20 ma analog signal)
- NEMA-4 electrical enclosures

### Operating Conditions

- Maximum inlet pressure: 3 bar (44 psi)
- Maximum operating temperature: 40°C (104°F)
- Minimum operating temperature: 1°C (33°F)

### Utility Requirements

#### Electrical Connection

AP 1:	1 ph	230v	50 A
AP 2:	1 ph	230v	30 A or
	3 ph	230v	25 A or
	3 ph	460v	15 A
AP 3/3x:	3 ph	230v	40 A or
	3 ph	460v	25 A
AP 4:	3 ph	460v	40 A
AP 6:	3 ph	460v	70 A

Other voltage can be accommodated, if required. Water supply for CIP: 25-35°C (75-95°F)



Module cutaway showing hollow fibers



#### Microza Hollow Fiber Microfiltration Module<sup>9</sup>

- Membrane material: PVDF
- Pore rating: 0.1 micron ( $\mu\text{m}$ )
- Fiber OD/ID: 1.3 mm/0.7 mm
- Active filter area: 538 ft<sup>2</sup>
- Module size: 6" diameter x 79" long
- Housing: ABS
- Gasket: EPDM
- Potting material: Urethane

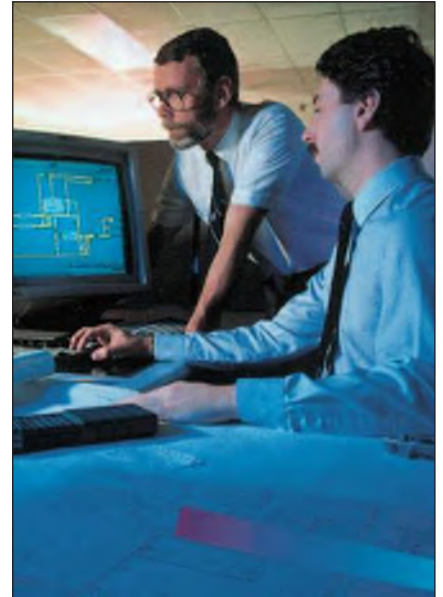
<sup>9</sup> Ultrafilters also available

#### NSF System Listing

Pall's family of hollow fiber membrane systems were the first "full systems" to be listed in accordance with ANSI/NSF 61 specifications. The Pall Aria AP system is manufactured from NSF-approved materials and meets all requirements for potable water service.

#### ISO 9000 Certification

Pall's North American manufacturing, engineering, sales, and marketing operations have received ISO 9001 registration from Lloyd's Register of Quality Assurance Limited. ISO 9001, which also covers design and development functions, represents the highest, most comprehensive level of ISO 9000 certification. The quality system and procedures are regularly audited to assure compliance and proper record keeping before the certification is renewed.



Pall R&D team members

# Pall Aria AP Systems - Operations

## Clean Water, Clean System

### Filtration (Normal Production)

Feed water enters the bottom of the module and is distributed uniformly to the outside of the fibers. Since it is under pressure, the water passes through the hollow fiber membranes, and filtered water exits through the top of the module. Under normal conditions, all of the feed water flows through the membranes and exits as filtered water. Depending on the feed quality, a small amount of the feed water may be circulated past the outside of the hollow fibers. This flow prevents the accumulation of foulants and debris on the surface of the membrane and helps to evenly distribute flow through the membrane fibers.

### Flux Maintenance (FM)

As water is filtered, rejected particulate accumulates in the module on the surface of the membrane fiber. The effect is a flow restriction in the module, resulting in an increase in transmembrane pressure (TMP). FM is a two-step process, consisting of simultaneous air scrubbing (AS) and reverse filtration (RF), followed by flushing with feed or filtered water. This is a mechanical process to remove the debris from the module and reduce the rate of overall increase in transmembrane pressure.

Flux maintenance is initiated at a preset interval of water throughput or, as a secondary trigger, by a preset time interval. The air valve opens and air is injected at low pressure into the feed side of the module. At the same time, filtered water that has been collected in the RF tank is pumped in the reverse direction through the module and out through the main system drain. Air and RF flow are then stopped. At this point, most, if not all, accumulated debris in the module has been swept to drain.

To complete the cycle, a flush is performed by circulating feed or filtrate, depending on raw water quality, at high velocity from the feed/RF tank along the outside and then the inside of the membrane fibers. This last flow of liquid is directed through the excess recirculation port of the module to drain. This further dislodges and removes debris from the module that was captured by the membrane fibers.

Pall Aria AP systems perform this fully automated cycle every 20 - 120 minutes, interrupting forward flow for about 1.5 - 2 minutes.



### Enhanced Flux Maintenance (EFM)

To ensure maximum efficiency and lowest total cost of ownership, Pall developed an enhanced cleaning technique to keep the membranes free of fouling materials. EFM is a fully automated process that uses water with mild chemical solutions to significantly reduce TMP. A reduction in TMP decreases pumping energy and results in fewer modules, which in turn scales down the system footprint and lowers facility heating and cooling costs.

The highly crystalline polyvinylidene fluoride (PVDF) hollow fiber membranes that are part of every Pall Aria AP system make EFM possible. These fibers are exceptionally strong and chemically resistant, with a life of 10+ years, even with daily EFM. When changes in water conditions make EFM unnecessary, the on-board control system disables it, increasing efficiency of the Pall Aria AP system.



### Chemical Clean-in-Place (CIP)

Backwash and EFM are designed to remove particulate matter and foulants. In most applications, it will occasionally be necessary to execute a complete CIP process. The CIP process is a two-step protocol using a caustic solution with chlorine and an acidic solution. This process will return the modules to nearly new condition and can be performed hundreds of times over the life of the modules.

Since CIP operation is infrequent, the process is semi-automated. The cleaning and rinse cycles are programmed for manual initiation and require minimal operator intervention.



Pall Aria AP-4 System

### Pretreatment Requirements

Pall Aria AP water treatment systems provide reliable, low maintenance performance. A 400 µm strainer is included on the feed water line to prevent debris from clogging small passages in the system.

### Enclosures

A heated structure is required where freezing temperatures are expected. A roof may be required in other areas to prevent damage from sunlight and high temperatures.

A pre-engineered metal, concrete, or wood frame building is acceptable and can be designed to address many aesthetic concerns.

### Seismic Design

The skid can be modified for use in Seismic Zone 4 areas (highest hazard). An anchoring plan will be furnished upon request.

### CIP Conditions

Pall recommends that all chemicals for treatment and CIP be purchased in solution form. Water for CIP should be heated to 31-38°C (90-100°F). Contact Pall to obtain the recommended CIP procedures and specifications for chemicals.

### Wastewater Disposal

The FM wastewater and CIP and EFM wastes can be discharged to a sanitary sewer, if available. In areas without sanitary sewers, the FM wastewater can be discharged to a settling pond to remove suspended solids.

The clarified supernatant may be discharged to a local receiving stream or recycled to the plant feed water. Pilot testing may be required before recycling the supernatant. If sanitary sewers are unavailable, CIP and EFM wastes should be combined and neutralized prior to collection and disposal by a waste hauler. These wastes can be disposed of like septic system sludge. The customer is responsible for contacting the local regulatory agencies and obtaining the appropriate permits and approvals before initiating any discharge of process wastewater.

## Contact Us for Support or Information

Remote online monitoring of system performance by Pall water specialists and membrane maintenance contracts are available from Pall. Contact your local Pall representative or Pall Corporation to obtain more information.







ENABLING A  
GREENER  
FUTURE<sup>SM</sup>



Pall Corporation

25 Harbor Park Drive  
Port Washington, NY 11050  
+1 516 801 9906 telephone  
+1 888 428 5597 toll free US  
water@pall.com

Visit us on the Web at [www.pall.com/water](http://www.pall.com/water)

Pall Corporation has offices and plants throughout the world. For Pall representatives in your area, please go to [www.pall.com/contact](http://www.pall.com/contact).

Because of technological developments related to the products, systems, and/or services described herein, the data and procedures are subject to change without notice. Please consult your Pall representative or visit [www.pall.com](http://www.pall.com) to verify that this information remains valid.

© Copyright 2004, 2006, 2011, Pall Corporation. Pall, , and Pall Aria are trademarks of Pall Corporation. ® indicates a trademark registered in the USA. *Filtration. Separation. Solution.* and **ENABLING A GREENER FUTURE** are service marks of Pall Corporation.

*Filtration. Separation. Solution.<sup>SM</sup>*

WP-300e

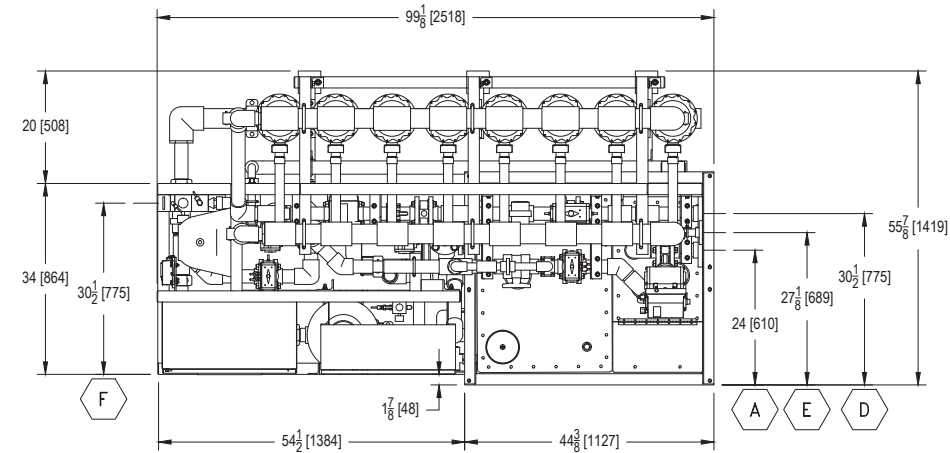
Produced in the USA

August 2011

NOTES:

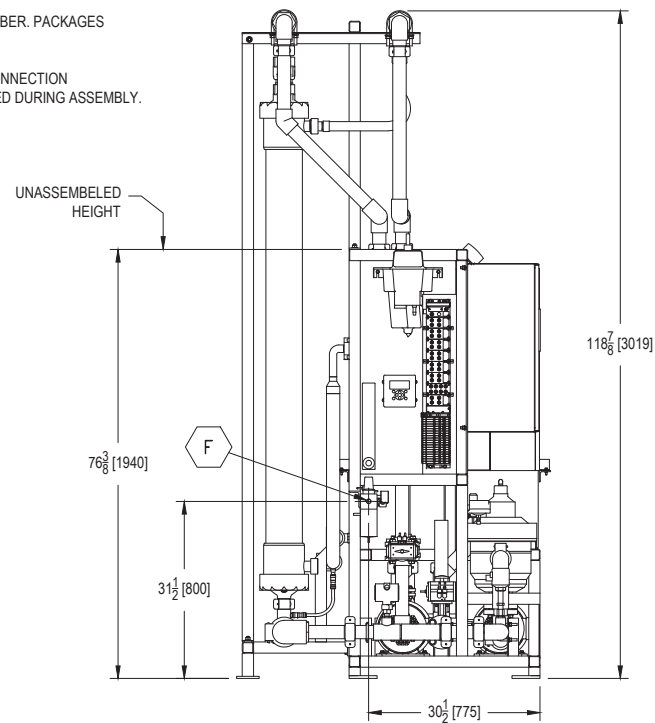
- DO NOT STORE THE MODULES OR THEIR SHIPPING CONTAINERS OUTSIDE OR IN AN AREA WHERE THERE WILL BE EXPOSURE TO DIRECT SUNLIGHT, EXCESSIVE HEAT, OR COLD. PALL CORPORATION REQUIRES MEMBRANES BE STORED IN A CONTROLLED, SECURE ENVIRONMENT TO GUARANTEE MODULES ARE NOT DAMAGED DURING STORAGE.
- DO NOT DROP OR EXPOSE THE MODULES OR THEIR SHIPPING CONTAINERS TO SHOCK OR IMPACT. THERE MAY BE DAMAGE TO THE MEMBRANE EVEN IF NO VISIBLE DAMAGE TO THE MODULE CASE IS EVIDENT.
- THE MODULE RACK ASSEMBLY AND INTERCONNECT PIPING ASSEMBLY WILL BE SHIPPED LOOSE FOR INSTALLATION IN THE FIELD.
- THIS DRAWING SHOWS (1) COMPLETE AP4 ASSEMBLY.
- THE DISKS ON ELASTOMER-SEATED BUTTERFLY VALVES MUST BE AT LEAST PARTIALLY OPEN WHEN TIGHTENING FLANGE BOLTS. FAILURE TO DO SO WILL CAUSE PREMATURE FAILURE, AND WILL VOID ALL WARRANTIES ON THE VALVE.
- REFER TO INSTALLATION INSTRUCTIONS FOR PIPING ASSEMBLY.
- THE CONTROL ENCLOSURE IS CONSTRUCTED OF CARBON STEEL, PAINTED BLUE AND RATED NEMA 4. THE USE OF ALL CONDUIT PENETRATION HUBS OF THE SAME ENVIRONMENTAL RATING AS THE ENCLOSURE IS REQUIRED. DO NOT PENETRATE THE TOP OF THE ENCLOSURE.
- ALL FLANGES ARE BOLT CIRCLE/HOLE SIZE EQUIVALENT TO ANSI 150# RATED FLANGES.
- FIELD PIPING, CONNECTING TO PALL EQUIPMENT, MUST BE ADEQUATELY SUPPORTED TO PREVENT ANY NOZZLE LOADS ON THE EQUIPMENT. DO NOT USE SKID CONNECTIONS TO SUPPORT PIPING.
- ANCHOR BOLTS FOR SECURING MODULE RACK TO HOUSEKEEPING PAD TO BE SIZED, SUPPLIED AND INSTALLED BY OTHERS.
- AFTER LEVELING OF MODULE RACK, SHIM AND GROUT AS NECESSARY (BY OTHERS).
- THE MODULE RACK FRAME IS SHIPPED UNASSEMBLED.
- PIPE/EQUIPMENT IS LABELED FOR FIELD INSTALLATION, INSTRUMENTS ARE PACKAGED AND LABELED ON OUTSIDE OF BOX.
- PIPE ASSEMBLIES/HARDWARE PACKAGED AND LABELED ACCORDING TO ITEM NUMBER. PACKAGES WITH MULTIPLE PARTS WILL HAVE QUANTITY INDICATED.
- TAKE NOTE: MACHINE GROOVE ON INTERCONNECT PIPING TO BE UTILIZED FOR CONNECTION TO SKID AND MODULE RACK. PROTECTION OF THIS SEALING SURFACE IS REQUIRED DURING ASSEMBLY.

**PRELIMINARY**  
**NOT FOR CONSTRUCTION**  
 LOCATIONS AND DIMENSIONS ARE FOR REFERENCE ONLY AND MUST BE VERIFIED BEFORE FINAL CONSTRUCTION.

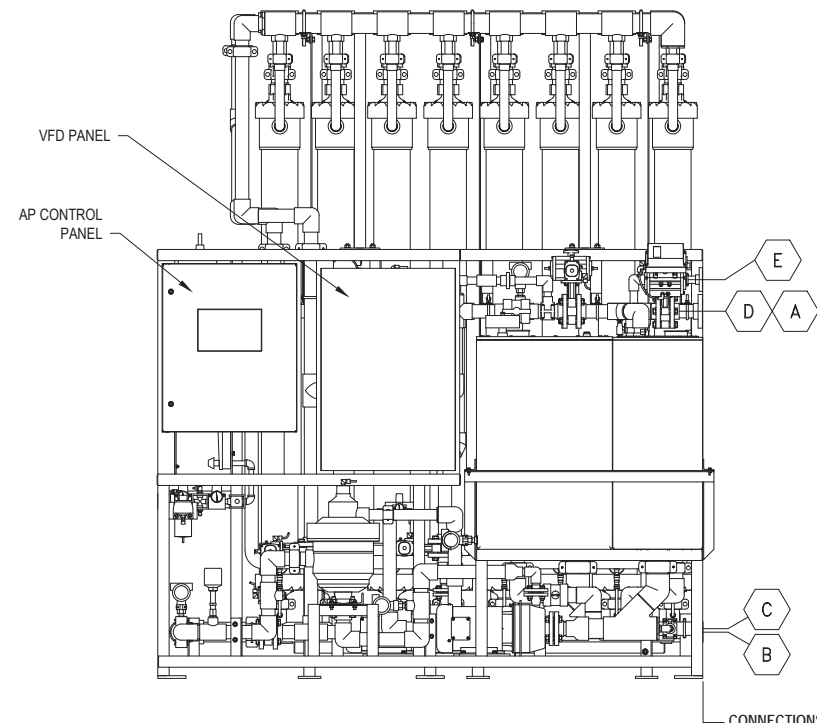


**PLAN VIEW**

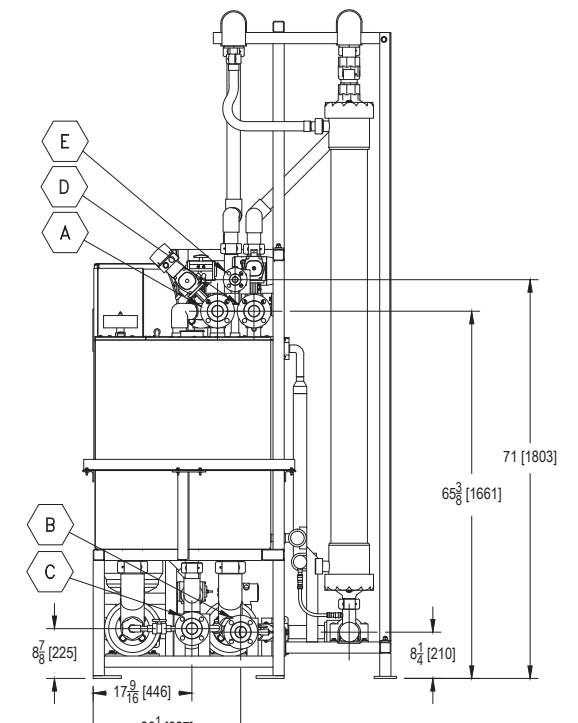
(SOME PIPING & TANK BANDING REMOVED FOR CLARITY)



**LEFT VIEW**



**FRONT VIEW**



**RIGHT VIEW**

CONNECTIONS A, B, C, D & E FLANGE FACES ARE FLUSH WITH THIS SIDE OF SKID

\* THESE CONNECTIONS MUST BE FREE DRAINING - GRAVITY

ITEM	DESCRIPTION	SIZE
F	COMPRESSED AIR SUPPLY	1/2" [12]
E	CIP MAKE UP WATER / EFM WATER	2" [50]
D	FILTRATE FORWARD	2" [50]
*C	MISC. DRAIN	2" [50]
*B	CIP / RF / AS MISC. DRAIN	2" [50]
A	FEED	2" [50]

DIMENSIONS PROVIDED WITHIN THIS DRAWING ARE FOR REFERENCE ONLY. BECAUSE OF FITTING SIZE VARIATIONS, PRIOR TO MAKING FINAL WELDS, PIPING SHALL BE DRY FIT UP TO FRAME TO ENSURE PROPER ALIGNMENT OF PIPING, FLANGES, BOLT HOLES, ETC.

SYSTEM	DRY (lb)	WET (lb)	CRATED (lb)	# MODS
AP2 SKID	2040	4200	3078	8

**AP 2 SKID LAYOUT - SCALE:1/16**

These commodities, technology or software may only be exported from the United States in accordance with the Export Administration Regulations. Diversion contrary to U.S. law is prohibited.	SEE SHEET 1 FOR REVISION	DRAWN BY: B. HARRIS PROJECT ENGINEER: --- ENGINEER: --- ENGINEER: --- CHECKER: ---	NAME: B. HARRIS DATE: 03JAN2017	PALL Corporation Pall Advanced Separation Systems Industrial, Corland NY Copyright 2017 PALL CORPORATION This document may contain confidential technical data, including trade secrets proprietary to Pall Corporation. The drawing, design rights and all other disclosures in this document are the property of Pall Corporation. Unauthorized use, copying, distribution to third parties, manufacture, or reproduction in whole or in part is prohibited.	
	DIMENSIONS ARE IN: <input type="checkbox"/> INCHES ONLY <input type="checkbox"/> MILLIMETER ONLY <input checked="" type="checkbox"/> IN [mm] <input type="checkbox"/> MM [IN]	TOLERANCE: FRACTION ± 1/8 ANGLE ± 2 DEG .XXXX ± .XXX ± .XX ± .X ±	CODE IDENTIFICATION NO.: 17238 PROJECT ID: W-#### DRAWING NAME:		ASSY.MF.CUSTOMER AP SYSTEM DESIGN - GENERAL ARRANGEMENT
	ALL FINISHED SURFACES: <input checked="" type="checkbox"/> μIN <input type="checkbox"/> μM SCALE: SEE LABEL FROM DRAWING THIRD ANGLE PROJECTION: <input checked="" type="checkbox"/>	DO NOT SCALE FROM DRAWING .XX ± .X ±	MATERIAL MASTER: ---- DWG SIZE: D SHEET: 1 OF 2		DRAWING NUMBER: NYCS00009235 SHEET: 1 OF 2
	IMPORTANT: BEFORE ATTEMPTING TO OPERATE OR INSTALL THIS SYSTEM, IT IS ESSENTIAL TO READ AND UNDERSTAND THIS PRODUCT'S OPERATION AND MAINTENANCE MANUAL (SHIPPED UNDER SEPARATE COVER). FAILURE TO READ THE OPERATION AND MAINTENANCE MANUAL BEFORE ATTEMPTING TO OPERATE ANY PALL CORPORATION EQUIPMENT MAY RESULT IN SERIOUS PERSONAL INJURY AND/OR PRODUCT DAMAGE, AND VOID ANY AND/OR ALL WARRANTIES.				TEMPLATE REV: R20133