TOWN OF CAIRO
WATER SYSTEM IMPROVEMENTS

PRELIMINARY ENGINEERING REPORT
IN SUPPORT OF DWSRF APPLICATION

Prepared for:

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September 3, 2015

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1.0 INTRODUCTION

The Town of Cairo currently supplies water to 782 customers in the water district. The District is shown on Figure 1. In 1991 the Town undertook a large-scale improvement project, the focus of which was switching from an unfiltered surface water source to wells for the District's source of supply in response to the Surface Water Treatment Rule. In 1998 this project was extended to include construction of a second source of supply using wells located at the old Water Company Reservoir. This effort was not successful and as a result water quality generally prevents use of all but the one large well in the Town Park. Redundancy is provided through the use of two pumps in this one usable well. The Town sees this as both a potential public health risk and a detriment to further growth.

In an effort to supplement the water supply the Town has made efforts for the past six years to identify additional groundwater sources in or around the District for development of a second supply. These efforts have exhausted most of the obvious opportunities and the Town has concluded that a more extensive effort will be needed to supplement the existing supply.

This report provides an analysis of the alternatives available for increasing supply and making the supplies more reliable and resistant to storms and other hazards which could render the one usable well unavailable for an extended period of time and leave the District essentially without water.

This report also describes other deficiencies in the system which the Town is proposing to address to improve the system such that a reliable system exists which can be maintained and operated in a sustainable manner.

2.0 EXISTING WATER SYSTEM

The District's original water supply came directly from surface water (the Reservoir) and the water was used without filtration. In 1991 the Town abandoned use of the reservoir and began to rely instead on wells. Water storage is provided by a 365,000 gallon tank. Much of the water system has been rebuilt within the past 20-years and old cast iron pipe was replaced with new PVC pipe. Leakage from the older cast iron remains a significant problem.

2.1 SOURCES OF WATER SUPPLY

The Town of Cairo relied on surface water sources south and west of the hamlet since the water system was first built in or around 1898. In 1991 the Town acquired the Cairo Water Company, and installed a caisson well in the Town Park and ceased use of the reservoir. The Park Well (also referred to as Well No. 1 and Well No. 2 since it is equipped with two pumps) is permitted for 216,000 gallons per day (GPD). The caisson

is fed by radial collector(s), typically produces high quality water and, despite its shallow depth and proximity to the Shinglekill has been determined by DOH to not be surface water influenced.

To provide a back-up source of water two new wells were drilled on land owned by the Town at the old Reservoir. These wells (No. 3 and No. 4) have significant water quality problems which have prevented them from being integrated into the routine operations of the water system since 1998.

Well No. 3 is an eight-inch well drilled in 1998 to a depth of 300-ft. This well was tested and permitted at a flow of 144,000-GPD. Well water is chlorinated and receives no further treatment. The well water contains sulfur, iron, manganese and methane in amounts that make water unusable as a supply.

Well No. 4 is an eight-inch well drilled in 2006 to a depth of 540-feet. The well does not appear to have been subjected to a full scale 72-hour pumping test and there is no record of a full analysis for Part 5 pollutants being conducted. In 2009 a pumping step-test was completed to assess yield and quality and the well was found to also contain iron and manganese above the MCL.

Since 2009 the Town has drilled at two sites and surveyed a number of existing wells in an effort to identify and develop new sources in and around the existing service area. To date these efforts have failed.

In the spring of 2015 very dry weather reduced the flow which the Park Well was able to produce. This reduced yield, combined with a moderate leak which could not be located, brought the District to the verge of having no water. Before the problems were resolved, the Town had already contacted SEMO in anticipation of needing an emergency filtration system to allow use of Well #3 and/or the old Surface Reservoir.

The Park Well is also located in the floodway of the Shinglekill. Although the floor of the well house is three feet above the 100-year flood elevation, the well house and underground collection piping is in no other way hardened against the erosive effects of flooding.

2.2 TRANSMISSION, DISTRIBUTION AND STORAGE

Much of the water distribution piping system was replaced in the 1990s with new PVC water mains. There are a number of streets (Railroad, Grove, Bross, Schmidt and Ross) which still have 4-inch or smaller cast iron main which poses continuing problems due to leakage. It also appears that many of the old water service lines were not replaced to the curb stop at the time the new main was put in on Main Street. Since this street is a

heavily trafficked street with significant streetscape improvements, curb and sidewalks replacement of those service lines will be costly and disruptive at this time.

The Park Well pumps directly into the collection system to meet demand and maintain the tank level. Water storage is provided by a 365,000 gallon steel tank located on Klingermann Drive, off Main Street at the western end of the District. The tank was constructed in 1992 and is a bolted panel tank with epoxy coated steel panels. The tank has experienced minor leakage at the joints which was remedied by re-torqueing bolts per the manufacturer's recommendations. The tank has evidence of rust at numerous points on the exterior. An interior inspection of the tank was conducted and also showed significant failure of the coating and corrosion at numerous points on the tank interior. Service on this tank will be required in the next five years. This will be complicated by the facts that there is no other system storage to rely on while the tank is being re-coated and the type of tank make re-coating very difficult.

2.3 TREATMENT

Water is disinfected using sodium hypochlorite injection at the park well. The water passes through 800-ft of 6-inch pipe water main. With both pumps running, the pipe provides less than 10-minutes of contact time before reaching the first customer.

2.4 SERVICE AREA AND CUSTOMERS

The water service is concentrated in the central business area of Cairo along Main Street. Currently water service is provided to 782 customers in the water district. The MHI for Cairo is $34,375 which is well below the State average of $58,003. Moreover, the District contains a disproportionate number of apartments which likely tend to make the actual income even lower. The District boundaries are shown on Figure 1. The water services by type are estimated to be as follow:

		Water Usage GPD
Residential	70%	66,000
Commercial	20%	19,000
Institutional	10%	9000
		94,000

Well water in many of the residential home surrounding the District are poor in quality and yield. Water would be extended to serve additional homes in and around the District which presently have inadequate supplies.

2.5 WATER USAGE

Pumping records from the wells indicate an average day flow over the past three years of 94,000-GPD. Metered water sales routinely are 70-percent or less of actual sales over the course of several years, indicating that meters are excessively worn or that

there are a significant number of unmetered services. Typical peak day flow is 210,000 GPD, however higher flows have occurred during water breaks.

Meters are in excess of 30-years old and many services are unmetered making accounting for and controlling water use impossible in many circumstances. As part of the project meters would be replaced and equipped with remote reading devices to reduce labor and allow for better management of the distribution system.

3.0 PROJECT OBJECTIVES

The project objectives include:

1. Development of additional source(s) of supply.
   A second and separate source of water in addition to the Park Well should be developed for the reasons presented above.

   A number of alternatives exist and would be evaluated in the Engineering Report and through testing. Alternatives to be evaluated include:
   - Interconnection with the Village of Catskill.
   - Treatment of water from Reservoir Wells.
   - Develop additional wells in alluvial deposits along a major stream such as the Catskill Creek.
   - Develop additional shallow wells in the along Shinglekill and treat for GWUDI as needed.

   Costs of all these alternatives are projected to be $500,000 to $1.5 million and will need to be evaluated for operations, water sales and equipment upkeep to provide a life-cycle cost.

2. Improvement of disinfection capacity at the Park well.
   For days when flow exceeds 144,000 GPD (11% of days) the second 100-GPM pump must run for part of the day. In these instances contact time before the first customer falls to approximately six minutes which is inadequate.

   To improve contact time an additional tank or large diameter piping could be installed at the park well.

3. Improvements to decayed and leaking water tank.
   The tank would be re-coated or replaced to provide a more long-term storage solution. In addition, an alternative would be considered where a new (smaller) tank would be built on a separate site and the existing tank re-coated.

4. Replacement of old mains and services that are a cause of frequent leakage and breaks. Concurrent with this work a meter survey and replacement program will be completed to equalize billing and reduce future labor in meter reading.

5. Extension of water service to insufficient yielding private wells at existing residential housing.

6. Installation of new meters and remote reading equipment.

4.0 PROJECT PRIORITIES

The project presented herein meets a significant number of the priority scoring criteria presented in the 2016 DWSRF Intended Use Plan. These criteria are as follow:

Factor		Score
A(1)(a) iii.	CT Disinfection is inadequate under some pumping conditions.	30
A(5) b	Exceedance of MCL for Iron and Manganese in Well No. 3 (not regularly used for this reason).	25
B(1) or C (7)	Inadequate source capacity exists since the Town relies on one well site, which is subject to drought conditions, is in the floodway.	50 or 5
C (2)(f)	The only finished water storage in the system is the one tank is in need of painting or replacement within the next five years.	10
C (3)	The system has an estimated 6400-ft of old small diameter cast iron and galvanized pipe in which significant leaks occur several times each year	5
D (1)	Two areas of potential extensions exist which would benefit residential properties with insufficient or poor quality water	40
E	There is a financial need for funding to help the project move forward. The MHI for Cairo is $34,375 which is well below the State average of $58,003. Moreover, the District contains a larger number of apartments which would tend to make income even lower.	25

5.0 SUMMARY AND CONCLUSION

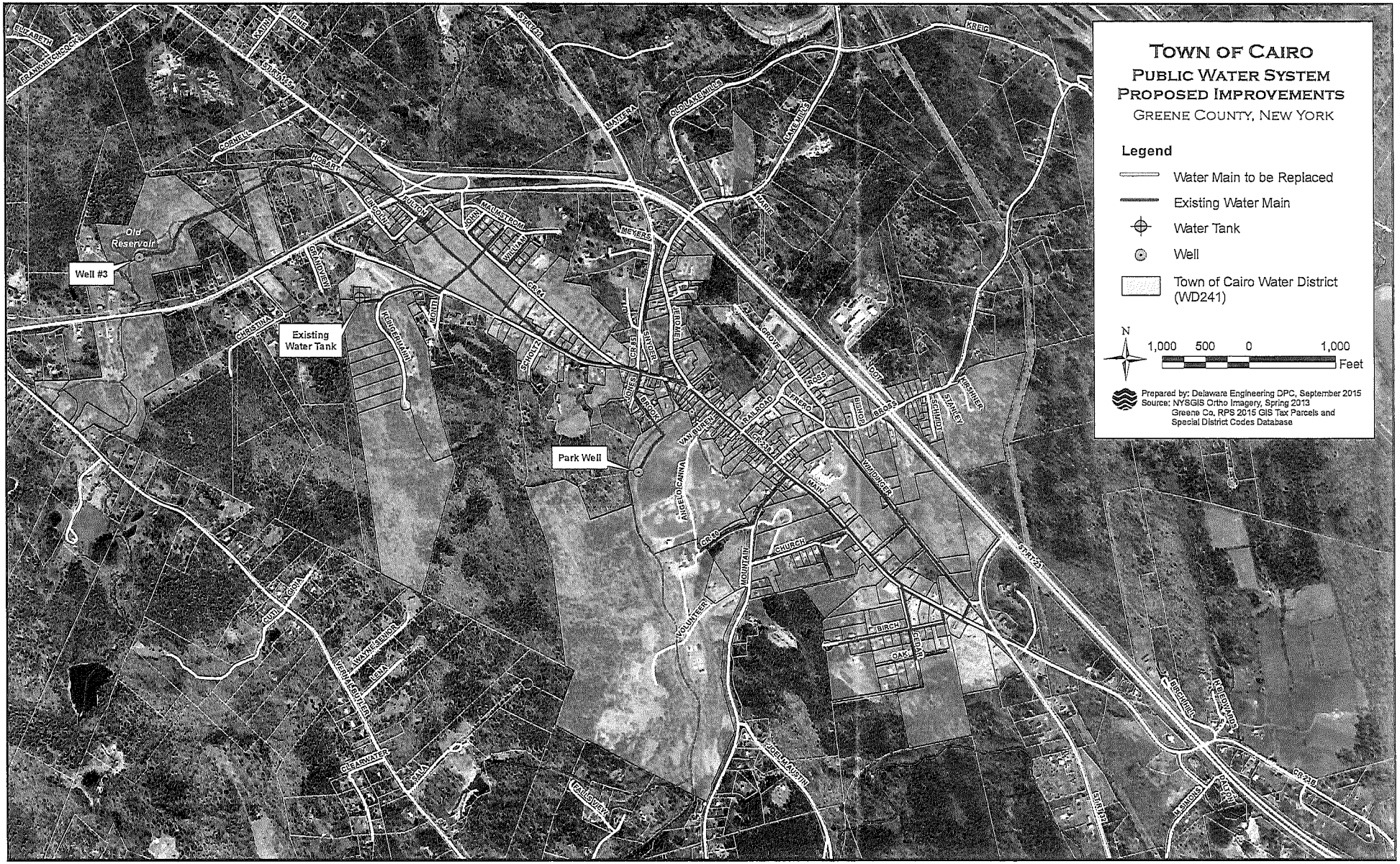
The Town of Cairo has made significant efforts over the past few years to address water capacity issues. The other system problems presented by the ageing tank and distribution system are also significant problems for the system, which make the capacity issues more problematic. The source capacity problems date back to the original DWSRF projects completed in the 1990s and were never fully resolved at that time.

TABLE 1.
CAIRO WATER SYSTEM - WATER IMPROVEMENTS
COST ESTIMATE AND RATE ANALYSIS

Construction Component				Cost
Replace old water mains & service	5000	ft	$200	$1,000,000
Hydrants	30	ea	$8,000	$240,000
Water Storage Tank				$400,000
New Wells/Source Supply	1	ea	$500,000	$500,000
Water meter replacement	350	ea	$300	$105,000
Improve CT Existing Well				$100,000
Service Extension	1500	ft	$175	$262,500
Construction Subtotal				$2,607,500
Engineering-Legal-Permits	15%			$391,125
Contingency	19%			$501,375
Project Total Cost				$3,500,000

RATE ANALYSIS FOR WATER IMPROVEMENTS

		Financing Method			
FINANCING TERMS & COSTS		Serial Bond	USDA	DWSRF	DWSRF
Project Total Cost		$3,500,000	$3,500,000	$3,500,000	$3,500,000
Potential Grant		$0	$600,000	$0	$2,000,000
Long-Term Debt Financed		$3,500,000	$2,900,000	$3,500,000	$1,500,000
Interest Rate on New Debt		3.500%	**2.250%**	**0.000%**	**0.000%**
Finance Term (years)		30	**38**	30	30
Annual Debt Payment		$190,300	$114,340	$116,667	$50,000
Current Operating Costs	$84,400	$119,000	$119,000	$119,000	$119,000
Existing Debt	$112,236	$112,236	$112,236	$112,236	$112,236
Added Operating Cost	**$0**	$15,000	$15,000	$15,000	$15,000
Annual District Expenses	$196,636	$436,536	$360,576	$362,903	$296,236
EDUs Added	0	40	40	40	40
Total EDUs	782	822	822	822	822
Revenue From EDUs	$196,636	$436,536	$360,576	$362,903	$296,236
Average User Rate (Annual)	$251	$531	$439	$441	$360
Annual Rate Increase		$531	$439	$441	$360
Rate per Month	$21	$44	$37	$37	$30
% Rate Increase		111%	74%	76%	43%



Town of Cairo
Public Water System Proposed Improvements
Greene County, New York

Legend

- Water Main to be Replaced
- Existing Water Main
- Water Tank
- Well
- Town of Cairo Water District (WD241)

N

1,000 500 0 1,000 Feet

Prepared by: Delaware Engineering DPC, September 2015
Source: NYSGIS Ortho Imagery, Spring 2013
Greene Co. RPS 2015 GIS Tax Parcels and Special District Codes Database