

Water Works System Needs Assessment

FOR

*Village of Sugar Grove
KANE COUNTY, ILLINOIS*

July 30, 2004

PREPARED BY:



**Engineering
Enterprises,
Inc.**

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Section 1 – Executive Summary

1.1 General

The purpose of this study is to evaluate the existing water works system in the Village of Sugar Grove and to determine the improvements necessary to accommodate the growing population. First, this study emphasizes the immediate needs of providing water services to the following six developments:

- Hannaford Farm
- Stillwater
- Neumann Homes
- Settlers Ridge
- Pulte
- Kaneland Community School

Together, these developments consist of approximately 2,730 acres.

Second, this study identifies the future needs of providing water to developments in accordance with the 2030 NIPC population projections and the draft of the Comprehensive Land Use Plan, prepared by URS TPAP. The planning area of the Village consists of approximately 23,000 acres. Exhibit A presents the NIPC 2030 Paint the Town boundary and the immediate proposed developments. Exhibit B shows the proposed land use within the Village's planning area.

Recommendations, based on cost effective engineering principles, are provided. It is intended for the Village to own and operate the proposed facilities.

1.2 Findings

Based on our analysis of the Village's Water Works System, the Village currently has a water storage deficit of 631,000 gallons. The Village is currently meeting

their supply and treatment needs. Any increase in population will require additional water supply sources.

The required improvements for the current deficiencies in the system and the immediate proposed developments consist of a variety of components. The major Water Works System improvements for the immediate proposed developments will include:

- ◆ Elevated Water Storage Tanks (4.5 MG)
- ◆ Deep and Shallow Wells (4,000 GPM)
- ◆ Water Treatment Facilities – Filtration and Cation Exchange
- ◆ Booster Pump and Pressure Reducing Valve Station
- ◆ Pressure Reducing Valve Stations (2)
- ◆ Watermain and Appurtenances

This water storage recommendation consists of 2.92 MG for the immediate proposed developments, 0.63 MG existing Village need, 0.20 MG to replace the Village Center tank, and 0.75 MG in surplus. This surplus of water storage is recommended to oversize the tank in the north for future developments because of the limited possible locations for future water storage tanks.

The staging of these water works improvements is dependent on the construction schedule and financing of the immediate proposed developments.

When the Village reaches the NIPC 2030 population projection, approximately 9.83 million gallons of additional storage and 14,676 gallons of additional supply will be necessary. The following additional improvements will be required when the Village reaches the 2030 projection:

- ◆ Elevated Water Storage Tanks (9.83 MG)
- ◆ Deep and Shallow Wells (14,676 GPM)

- ◆ Water Treatment Facilities – Filtration and Cation Exchange
- ◆ Booster Pump and Pressure Reducing Valve Stations
- ◆ Pressure Reducing Valve Stations
- ◆ Watermain and Appurtenances

The proposed immediate developments have an estimated population equivalence of 20,833. Population equivalents are a unit of measure often utilized to determine the impacts of additional water consumers to the system. Absent of historical data, one P.E. is often considered to be equal to 100 gallons per day consumption of treated water. One P.E. is often approximated as one additional residential consumer (the amount of water use per person is typically 100± gallons per day). The population equivalence can be estimated by land use type. The specified land uses were derived from Concept and Preliminary Plans of the developments that were on file with the Village. Utilizing the NIPC projections, the population in the year 2030 is projected to be 62,742; this projection is strictly residents and does not include any commercial or industrial water use customers. Therefore, a population equivalence of approximately 96,050 was used to forecast the long-range needs of the Village to accommodate residential and commercial demands (see Section 2 for a discussion of the components of this population equivalence). The above noted components adequately serve this population equivalence. Please refer to Table No. 1 below for a summary of the population equivalents, and required water storage and water supply requirements.

**Table No. 1: Summary of Population Equivalents and
 Water Storage and Water Supply Requirements
 Village of Sugar Grove, Kane County, Illinois**

Year / Event	2003	Immediate Proposed Developments	2030
Total Residential Population (including Prestbury)	7,851	27,346	62,742
Existing Population Equivalent (including Prestbury) ¹	7,851	7,851	7851
Additional Population Equivalent ¹			
- From 2003 to Immediate Proposed Developments		20,833	20,833
- From Immediate Proposed Developments to 2030			75,217
Total Population Equivalent (including Prestbury)¹	7,851	28,684	103,901
Existing Water Storage	0.70 MG	0.50 MG ²	0.50 MG ²
Proposed Additional Water Storage			
- From 2003 to Immediate Proposed Developments		4.50 MG	4.50 MG
- From Immediate Proposed Developments to 2030			9.83 MG
Total Provided Water Storage	0.70 MG	5.00 MG	14.83 MG
Deficit/Surplus Water Storage ²	-0.63 MG	+7.5 MG	0 MG
Existing Water Supply and Treatment	1,950 GPM	1,950 GPM	1,950 GPM
Proposed Water Supply and Treatment			
- From 2003 to Immediate Proposed Developments		4,000 GPM	4,000 GPM
- From Immediate Proposed Developments to 2030			14,676 GPM
Total Provided Water Supply and Treatment	1,950 GPM	5,950 GPM	20,626 GPM
Deficit/Surplus Water Supply and Treatment	0 GPM	-51 GPM	0 GPM

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¹ Population Equivalents include commercial developments in addition to residential.

² The Village Center Tank (0.20 MG) is targeted to be taken out of service.

³ + indicates a surplus, - indicates a deficit

To summarize, an additional 1,000-gallon per minute well is required for approximately every 5,143 population equivalents (PE); and an additional 1,000,000-gallon storage tank is needed for every 7,143 PE. As the Village matures, the water needs will change. We recommend that the Village continuously monitor and evaluate its Water Works System as the Village grows.

1.3 Recommendations

Construction costs for the 2030 population projection are not provided at this time due to the large magnitude of the study area. The estimated construction costs for the immediate proposed developments are \$24.66 million. These costs includes storage tanks, wells, treatment facilities, a booster pump / pressure reducing valve station, pressure reducing valve stations, and required water main improvements. In addition, the Village has existing water works system needs, which include water main improvements and an existing deficiency in water storage. The estimated construction costs of the water works system improvements necessary for the existing Village needs are \$1.71 million. The cost for oversizing the tank in the north is \$1.23 million.

Based on the average calculated costs of water storage and water supply and treatment, and the water main improvements necessary for the immediate proposed developments, we recommend the impact fee be \$1,325 per population equivalent as estimated by IEPA guidelines. Please refer to Table No. 2 for a breakdown of costs.

The total estimated construction costs of the water works system improvements necessary for the immediate proposed developments, existing Village needs, and oversizing the north tank are \$27.59 million. A summary of estimated costs associated with the water works system improvements is shown on Table No. 3. This table provides an itemized estimated cost for the previously noted improvements. These topics are further discussed within the body of this report.

**Table 2: Water Works System Improvements Per P.E.
Water System Connection Fee Analysis
Village of Sugar Grove, Kane County, Illinois**

WATER SUPPLY AND TREATMENT									
Capacity (GPM)		Additional P.E. Served ^a	Construction Cost - Well(s)	Construction Cost - Treatment	Contingency (10%)	Engineering (15%)	Soil & Material Testing	Total Project Cost	Cost Per P.E.
1,000	2 Shallow	5,143	\$450,000	\$2,920,200	\$337,000	\$556,000	\$5,000	\$4,268,200	\$830
1,000	1 Deep	5,143	\$630,000	\$2,180,900	\$281,000	\$463,800	\$5,000	\$3,560,700	\$692

^a Based on Reliable Source Capacity (Well operating 18 hours per day to meet the Maximum Day Demand) and a Maximum Day Demand to Average Day Demand of 2.1

WATER STORAGE COST PER P.E.							
Tower Volume (Gallons)	Additional P.E. Served ^c	Construction Cost	Contingency (10%)	Engineering (7%)	Soil & Material Testing	Total Project Cost	Cost Per P.E.
1,000,000	7,143	\$1,525,000	\$153,000	\$107,000	\$15,000	\$1,800,000	\$252
1,500,000	10,714	\$2,025,000	\$203,000	\$142,000	\$15,000	\$2,385,000	\$223
2,000,000	14,286	\$2,600,000	\$260,000	\$182,000	\$15,000	\$3,057,000	\$214

^c Based on Peak Hour Storage (Storage capacity to meet four hours of Peak Hour Demand using a maximum of 50% of the storage) and a Maximum Day Demand to Average Day Demand of 2.1

ADDITIONAL WATER SYSTEM IMPROVEMENTS							
Tower Volume (Gallons)	Additional P.E. Served ^e	Construction Cost	Contingency (5%)	Engineering (15%)	Soil & Material Testing	Total Project Cost	Cost Per P.E.
BOOSTER PUMP AND PRESSURE REDUCING VALVE STATION		\$405,000	\$20,000	\$61,000	\$10,000	\$496,000	
PRESSURE REDUCING VALVE STATIONS (2)		\$330,000	\$16,000	\$50,000	\$20,000	\$416,000	
WATER MAIN IMPROVEMENTS (SHOWN ON EXHIBIT F.)						\$3,106,690	
	20,833	\$735,000	\$36,000	\$111,000	\$30,000	\$4,018,690	\$193

^e Based on the following developments: Hannaford Farm, Settlers Ridge, Neumann Homes, Stillwater, Kaneland Community School, and Pulte

IMMEDIATE VILLAGE NEEDS			
Tower Volume (Gallons)	Additional P.E. Served	Total Project Cost	Cost Per P.E.
WATER STORAGE (EXISTING DEFICIT = 0.63 MG)		\$1,034,545	
WATER STORAGE (REPLACING VILLAGE CENTER TANK = 0.20 MG)		\$327,907	
REPLACING 4" WATER MAINS IN VILLAGE CENTER		\$345,968	
	20,833	\$1,708,420	\$82

FUTURE VILLAGE NEEDS			
Tower Volume (Gallons)	Additional P.E. Served	Total Project Cost	Cost Per P.E.
WATER STORAGE (OVERSIZING NORTH TANK = 0.75 MG)		\$1,228,010	
	20,833	\$1,228,010	\$59

Legend:

Staff Recommendation

CONNECTION FEE SUMMARY (COST PER P.E.)			
	Minimum	Average	Maximum
WATER SUPPLY AND TREATMENT	\$692	\$761	\$830
WATER STORAGE	\$214	\$230	\$252
ADDITIONAL WATER SYSTEM IMPROVEMENTS	\$193	\$193	\$193
IMMEDIATE VILLAGE NEEDS	\$82	\$82	\$82
FUTURE VILLAGE NEEDS	\$59	\$59	\$59
TOTAL WATER IMPACT	\$1,240	\$1,325	\$1,416

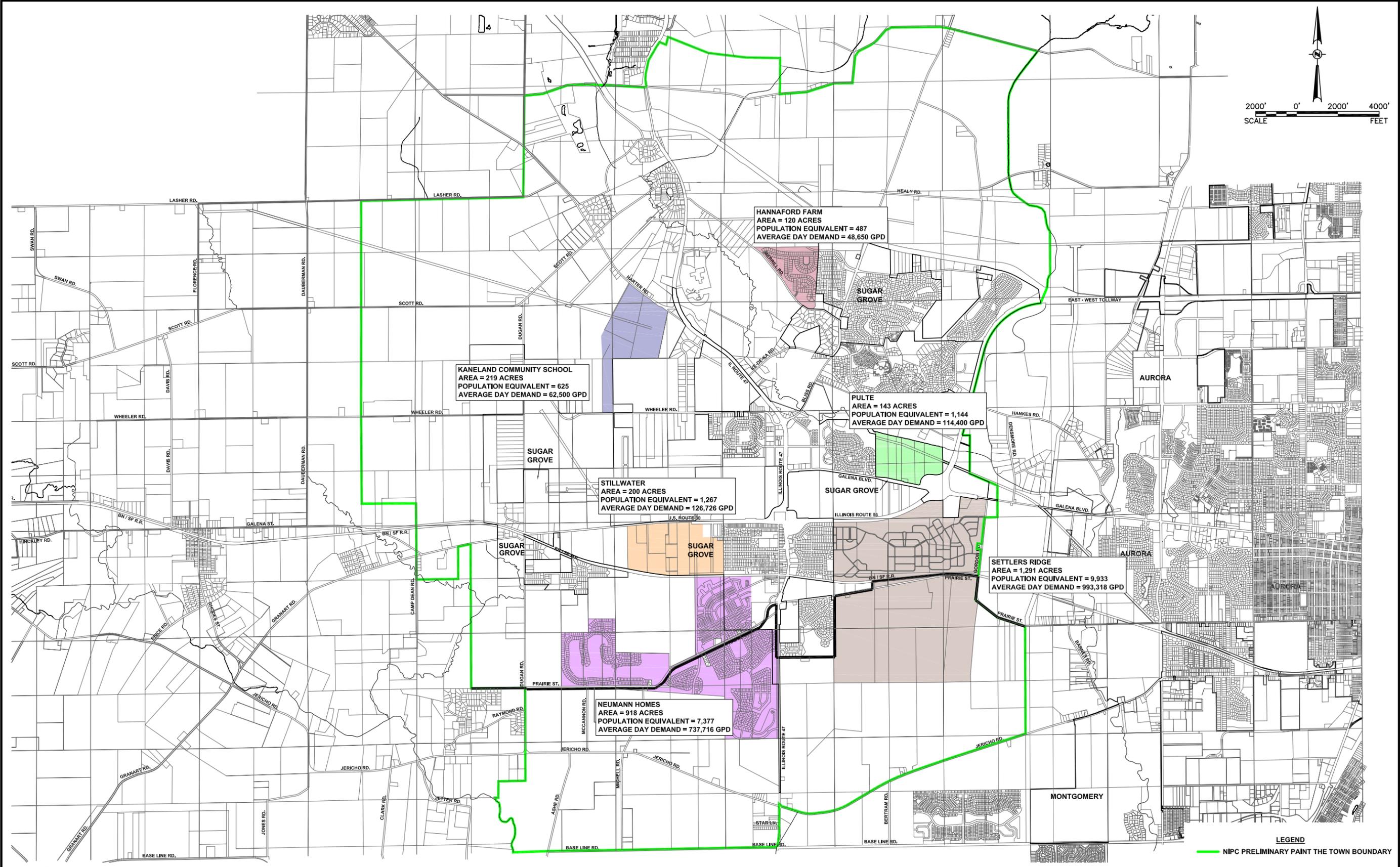
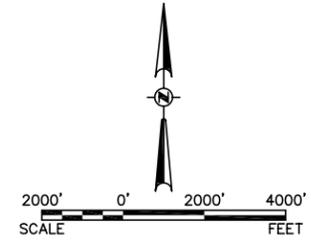
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**Table No. 3: Cost Estimate Summary for Water Works System Improvements
Immediate Proposed Developments and Existing Village Needs
Village of Sugar Grove, Kane County, Illinois**

Improvement	Est. Cost w/ Contingency and Engineering
Hannaford Farm (487 P.E.)	
Required Water Supply and Treatment = 95 GPM	\$ 370,677
Required Water Storage = 0.07 MG	\$ 111,781
Subtotal -- Hannaford Farm	\$ 482,458
Settlers Ridge (9,933 P.E.)	
Required Water Supply and Treatment = 1,931 GPM	\$ 7,560,434
Required Water Storage = 1.39 MG	\$ 2,279,921
Subtotal -- Settlers Ridge	\$ 9,840,355
Neumann Homes (7,377 P.E.)	
Required Water Supply and Treatment = 1,434 GPM	\$ 5,614,952
Required Water Storage = 1.03 MG	\$ 1,693,243
Subtotal -- Neumann Homes	\$ 7,308,195
Stillwater (1,267 P.E.)	
Required Water Supply and Treatment = 246 GPM	\$ 964,368
Required Water Storage = 0.18 MG	\$ 290,815
Subtotal -- Stillwater	\$ 1,255,183
Pulte (1,144 P.E.)	
Required Water Supply and Treatment = 222 GPM	\$ 870,748
Required Water Storage = 0.16 MG	\$ 262,582
Subtotal -- Pulte	\$ 1,133,330
Kaneland Community School (625 P.E.)	
Required Water Supply and Treatment = 122 GPM	\$ 475,714
Required Water Storage = 0.09 MG	\$ 143,456
Subtotal -- Kaneland Community School	\$ 619,171
Additional Water Works System Improvements	
Off-site Watermain	\$ 3,106,690
Booster Pump Station / Pressure Reducing Valve Stations	\$ 912,000
Subtotal -- Additional Water Works System Improvements	\$ 4,018,690
Subtotal Estimated Cost for Water Works System Improvements for the Immediate Proposed Developments	
	\$ 24,657,382
Immediate Village Needs	
Required Water Supply and Treatment = 0 GPM	\$ -
Required Water Storage (Existing Deficit) = 0.63 MG	\$ 1,034,545
Water Storage (Replacing the Village Center Tank) = 0.20 MG	\$ 327,907
Replacement of 4" Water Mains	\$ 345,968
Subtotal -- Immediate Village Needs	\$ 1,708,420
Subtotal -- Immediate Village Needs	
	\$ 1,708,420
Future Village Needs	
Water Storage (Oversizing the North Tank) = 0.75 MG	\$ 1,228,010
Subtotal -- Future Village Needs	\$ 1,228,010
Subtotal -- Future Village Needs	
	\$ 1,228,010
Total Estimated Costs for Water Works System Improvements	\$ 27,593,812

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Note: All cost estimates are based on 2004 construction costs.



LEGEND
 ——— NPC PRELIMINARY PAINT THE TOWN BOUNDARY

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VILLAGE OF SUGAR GROVE
 KANE COUNTY, ILLINOIS

NO.	DATE	REVISIONS

WATER WORKS SYSTEM
 NEEDS ASSESSMENT

VINCINITY MAP, PROJECTED
 POPULATION AND WATER USE

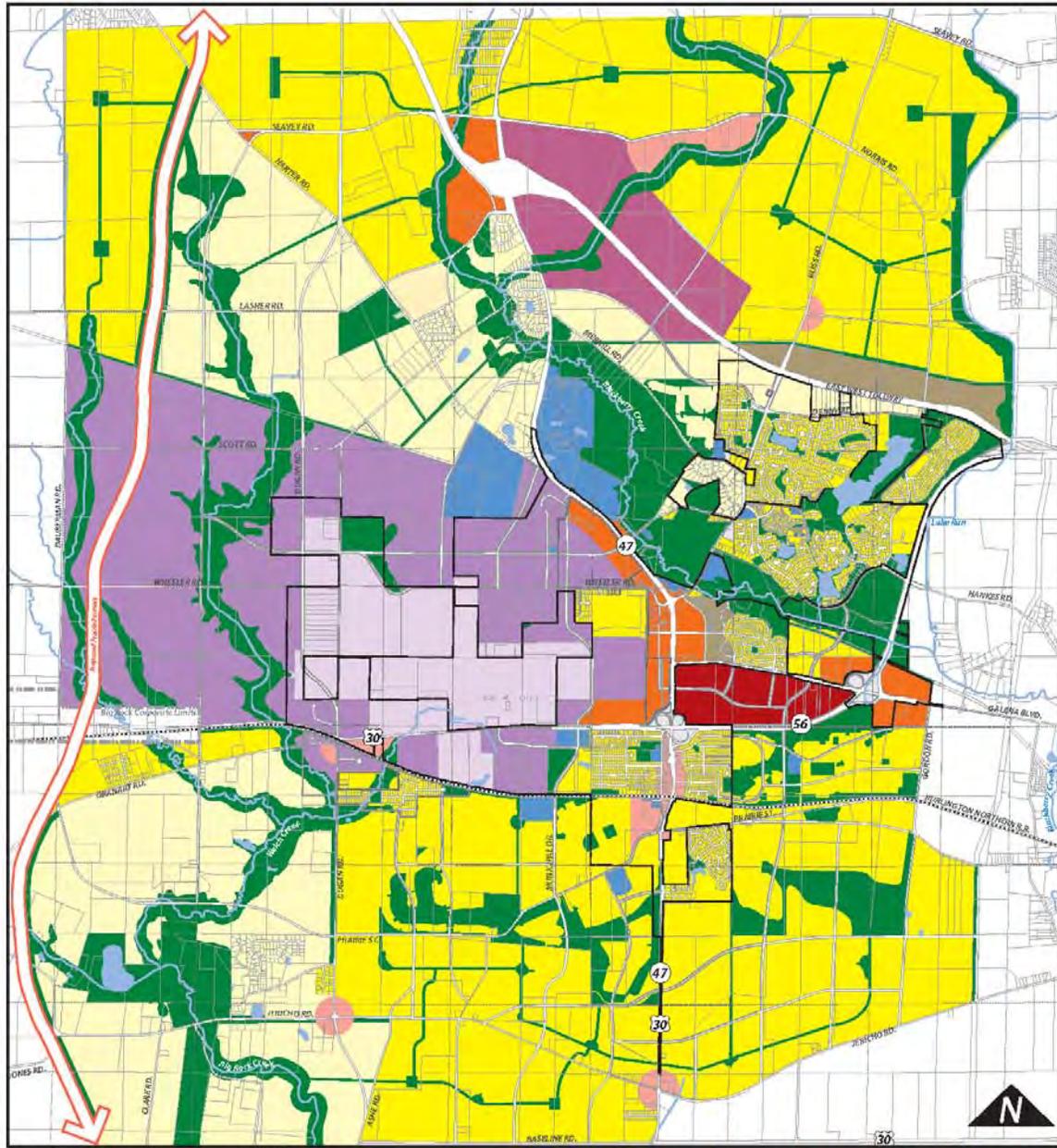
DATE: JUNE 2004
 PROJ. NO.: SG0235
 FILE NO.: SGO40010
EXHIBIT A

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Exhibit B: Land Use Plan
 Village of Sugar Grove, Kane County, Illinois

- Estate Residential
- Single Family Residential
- Multi-Family Residential
- Neighborhood Commercial
- Town Center Commercial
- Corridor Commercial
- Corporate Campus
- Business Park
- Open Space
- Public/Semi-Public
- Airport

Land Use Plan
DRAFT 2



--- Village of Sugar Grove Corporate Limits
 --- Stream/Watercourse

Village of Sugar Grove Comprehensive Plan
 Prepared By: URS • TPAP

Section 2 – Population and Flow Projections

2.1 General

The specified land use for the proposed immediate developments consists primarily of residential, commercial, and public/semipublic. Table No. 4 presents the proposed land use. The NIPC 2030 projection includes a population projection of 62,742 people and an additional 4,000 acres of commercial development. The specified land uses were derived from Concept Plans of the developments and the draft of the Comprehensive Land Use Plan prepared by URS-TPAP that were on file with the Village on April 1, 2004 (See Exhibit B).

2.2 Population and Flow Projections

The Village of Sugar Grove was incorporated in July 1957 with an approximate population of 200 people. The most recent population estimates for the Village of Sugar Grove were determined as part of the 2000 U.S. census and the 2003 special census. The information for the 2030 population projection for the Village was provided by the Northeastern Illinois Planning Commission (NIPC). According to the 2003 special census, the Sugar Grove population is 6,051. This does not include a population of approximately 1,800 in Prestbury Subdivision. Therefore, the total population currently being served by the existing waterworks system is 7,851. NIPC projects that by the year 2030, the Village will have a population of 62,742, including the Prestbury Subdivision.

Populations were projected based upon the draft of the Land Use Plan prepared by URS-TPAP and are shown in Exhibit B. Exhibit A provides projected population equivalents and average daily demands for the immediate developments. The population equivalence resulting from the immediate development is 20,833. All projections are summarized in Table 4.

Flow projections help provide a reasonable framework to conduct an analysis. From our experience and review of literature, we recommend using an average daily flow of 100 gallons per capita per day for residential areas and 1,000 gallons per acre per day for commercial areas. The remaining assumptions are noted within Table No. 4.

Table No. 4 projects the average day for the water works system for the proposed developments, which equal 2,083,310 gallons per day (gpd). The 2003 average daily pumpage is 780,001 gpd. Therefore, the total average daily pumpage is projected to be 2,863,311 gpd. Accordingly, the peak hourly flow for the water works system equals 12,025,906 gpd (See Section 3.1), assuming the maximum day to average day demand ratio is 2.1.

Table No. 4 also projects the average day for the water works system in the year 2030 based on the NIPC estimated population, which equals 9,604,960 gallons per minutes (gpm) in addition to the current demand of 780,001 gpd. Therefore, the total average daily pumpage is projected to be 10,384,961 gpd. Accordingly, the peak hourly flow for the water works system equals 43,616,836 gpd (See Section 3.1), assuming the maximum day to average day demand ratio is 2.1.

**Table No. 4: Projected Population And Water Use
 Village of Sugar Grove, Kane County, Illinois**

Proposed Development	Area (Acres)	Units	Population Equivalence	Average Day (Gal./Day)
Hannford Farm (Redbud Properties)				
- Residential	120.0	139	487	48,650
Sub-total	120.0	139	487	48,650
Settlers Ridge (Kimball Hill)				
- Residential	681.0	2,724	9,534	953,400
- Commercial / Retail	28.0	--	280	28,000
- Medical / Professional Offices	25.0	--	119	11,918
- Metra	31.0	--		
- Open Space & Roadways	526.0	--	--	--
Sub-total	1,291.0	2,724	9,933	993,318
Clublands (Neumann Homes)				
- Residential	375.7	2,054	7,189	718,900
- Commercial	4.8	--	48	4,830
- Parks	8.9	--	90	8,986
- School	15.3	--	50	5,000
- Open Space & Roadways	513.4	--	--	--
Sub-total	918.1	2,054	7,377	737,716
Pulte				
- Residential*	143	--	1,144	114,400
Sub-total	143	0	1,144	114,400
Stillwater				
- Residential	88	326	1,141	114,100
- Commercial	11.2	--	112	11,200
- Golf Course	86	--	--	--
- Parks	5.9	--	14	1,426
- Open Space & Roadways	10.1	--	--	--
Sub-total	200	326	1,267	126,726
Kaneland Community School Site				
- High School	--	--	400	40,000
- Middle School	--	--	225	22,500
Sub-total	200	0	625	62,500
2030 NIPC Projection				
- Residential	--	10,113	35,397	3,539,650
- Commercial	3,982	--	39,820	3,982,000
Sub-total	3,982	10,113	75,217	7,521,650
Total	6,854	15,356	96,050	9,604,960

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- Note: -- Residential = 3.5 P.E./Unit & 100 Gal./(Day-P.E.)
- Residential* = 8 P.E./Acre & 100 Gal./(Day-P.E.)
 - Commercial = 1,000 Gal/(Acre-Day) or 100 Gal./(Day-P.E.)
 - Parks = 25% of Residential P.E. @ 5 Gal/(Day-P.E.)
 - Community Center & Church = 200 People Per Day @ 25 Gal/(Person-Day)
 - Schools = 25 Gal/(Day-P.E.)
 - The Kaneland Community School Site is expected to serve approximately 1600 high school and 900 grade school students. This is a total of 2500 students.
 - 2 P.E./acre was assumed to determine the projected population in 2030 within the project boundary.
The total area within the project boundary is 21,949 acres.
 - The 2003 special population is 6,051. This did not include an approximate 1,800 people in the Prestbury Subdivision.
 - NIPC projects a population of 62,742 people in the year 2030 (This includes the Prestbury Subdivision population.)

Section 3 – Water Works System

3.1 Water Storage

The required water storage volume for the study area was derived from the analysis of three parameters. These parameters and their corresponding descriptions are listed below.

1. *Peak Hourly Storage* – The system's ability to supply the peak hourly demand (gallons/day) for four consecutive hours without depleting storage more than 50%.
2. *Fire Flow* – The system's ability to supply a targeted fire flow and the maximum day demand with the largest well out of service. The targeted fire flow equals 3,000 gallons/minute for three consecutive hours.
3. *Emergency Supply* – The system's ability to supply the average day demand (gallons/day) with the elevated tank at 80% capacity.

Based on the Village's past water use, the maximum day is generally 2.7 times the average day. The peak hour is generally two times the maximum day. In similar communities, the ratio of maximum day to average day is approximately 2 or 2.1. With this high ratio of 2.7 between the maximum and average days, the storage requirement for the immediate developments increases from 2,916,634 gallons to 3,749,958 gallons. Similarly, the supply requirements increase from 4,051 gpm to 5,208 gpm. Additional tanks and wells will be necessary, and larger water main will also be needed throughout the system if a water restriction not implemented.

By enforcing appropriate water restrictions within the Village, the ratio of maximum day to average day should be reduced to at least 2.1. Therefore, a

factor of 2.1 was assumed for all water works recommendations. Thus, the maximum day for the immediate development equals 4,374,951 gpd and the peak hour for the development equals 8,749,902 gpd. Peak Hourly Storage arises as the controlling scenario, with a minimum volume requirement of approximately 2,916,634 gallons. Refer to Table No. 5 for the analysis of each scenario. The Emergency Supply scenario assumes an emergency generator at one water well and water treatment facility site.

**Table No. 5: Water Storage Volume
 Village of Sugar Grove, Kane County, Illinois
 Immediate Development (Maximum Day:Average Day = 2.1)**

Controlling Scenario Of Water Storage

Scenario	Minimum Water Storage Volume (Gal.)
Peak Hourly Storage	2,916,634
Fire Flow	244,836
Emergency Supply	804,138

Calculation Per Scenario Of Water Storage

Scenario	Calculation Of Minimum Water Storage Volume (Gal.)
Peak Hourly Storage	Peak Demand For 4 Hours = 8,749,902 Gallons/Day x (1 Day / 24 Hours) x 4 Hours = 1,458,317 Gallons Min. Volume = 1,458,317 Gallons / 50% = 2,916,634 Gallons
Fire Flow	Max. Demand For 3 Hours = 4,374,951 Gallons x (1 Day / 24 Hours) x 3 Hours = 546,869 Gallons Fire Flow For 3 Hours = 3,000 Gallons/Minute x (60 Minutes / 1 Hour) x 3 Hours = 540,000 Gallons Required Demand = 546,869 Gallons + 540,000 Gallons = 1,086,869 Gallons Min. Volume = (1,086,869 Gallons - [(4000 + 1950 - 1000) x (60 Min. / Hour) x 3 Hours] = 244,836 Gallons
Emergency Supply	Operating Well = largest well capacity (1,000 Gpm) x 60 Minutes x 24 Hours = 1,440,000 Gallons Required Demand = Average Day Demand (2,083,310 Gallons) - 1,440,000 Gallons = 643,310 Gallons Min. Volume = Required Demand (643,310 Gallons) / 80% = 804,138 Gallons

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- Note: -- Denotes Controlling Scenario Of Water Supply.
- Recommended Water Storage Volume = 2,916,634 Gallons.
 - Peak Hourly Storage = The system's ability to supply the peak hourly demand for 4 consecutive hours without depleting storage more than 50%.
 - Fire Flow = The system's ability to supply a targeted fire flow and the maximum day demand with the largest well out of service. The targeted fire flow equals 3,000 gallons/minutes for 3 consecutive hours.
 - Emergency Supply = The system's ability to supply the average day demand with the EWST at 80% capacity.
 - Average Day Demand = 2,083,310 Gallons/Day
 - Maximum Day Demand = 4,374,951 Gallons/Day
 - Peak Hourly Demand = 8,749,902 Gallons/Day
 - A generator supplying a 1,000 gpm deep well is assumed with the Emergency Supply Scenario.

Based on the Peak Hour Storage requirement and a maximum day demand to average day demand of 2.1, an additional 1,000,000-gallon storage tank is needed for approximately every 7,143 people.

Two water storage options exist, an elevated tank or a standpipe. The functions of an elevated tank and a standpipe greatly differ. Operating independently of any mechanical system, an elevated tank relies solely upon gravity to supply water to the distribution system, and the entire contents of the tank are available for use at any time. In contrast, only one-third of a standpipe's volume operates via gravity. Booster pumping stations are required to deliver the remaining volume of the tank to the water distribution system. In case of a power failure, a generator is necessary to accommodate the booster pumping stations. Also, to prevent stagnant water, a standpipe requires additional chlorinating equipment.

For the immediate future, elevated water storage tanks are most economical and feasible for a community of Sugar Grove's size. However, as the Village of Sugar Grove progresses and matures, and emergency supply is not a controlling factor, standpipes and ground storage reservoirs may become a more viable alternative for the Village.

Three elevated water storage tanks are proposed to accommodate the immediate developments and the existing deficit in the Village's water storage. Exhibit C depicts the optimum location for these three (3) elevated tanks. The locations increase or maintain the fire flow in the existing system and ensure sufficient fire flow and pressure throughout the immediate proposed developments. The strict FAA requirements and ground elevations were two of the many controlling factors when determining the optimum tank locations.

The Village currently operates the Water Works System within one pressure zone. Due to significant elevation differences south of Prairie Street, we recommend developing a second pressure zone for the southern portion of the

Village’s planning area. This additional pressure zone is needed to prevent over-pressurizing the watermain and residences to be constructed south of Prairie Street. This new lower pressure zone serves the majority of the land area south of Prairie Street. Portions of the Neumann Homes and Settlers Ridge Subdivision are within this pressure zone. The newly created pressure zone requires 2 booster pumping and pressure reducing valve stations and 2 pressure reducing valve stations to serve the proposed developments. The booster pumps will allow water to transfer from the lower zone to the upper zone. Alternately, the pressure reducing valves will allow water transfer from the upper zone to the lower zone. Exhibit D shows the approximate location of these improvements.

Table No. 6 shows the recommended top capacity lines for each elevated tank needed to optimize the pressures within the newly created pressure zone. Table No. 6 also presents the expected pressures within each pressure zone. Exhibit C identifies the approximate limits of each pressure zone.

**Table No. 6: Pressure Zone Summary
 Village of Sugar Grove, Kane County, Illinois**

		Hydraulic Grade Line			Ground Elevation (Feet)	Static Pressure		
		High (Feet)	Mid (Feet)	Low (Feet)		High (Psi)	Mid (Psi)	Low (Psi)
Zone 1	Yellow				770	48.3	39.3	36.4
	1 - 200,000 Gal.	874.9	860.6	856.2	760	52.6	43.6	40.7
	1 - 500,000 Gal.	881.3	862.5	853.8	750	57.0	48.0	45.0
					740	61.3	52.3	49.4
	The controlling elevation for the high static pressure is 881.3.				730	65.6	56.7	53.7
	The controlling elevation for the low static pressure is 853.8.				720	70.0	61.0	58.1
					710	74.3	65.3	62.4
					700	78.7	69.7	66.7
					690	83.0	74.0	71.1
	Zone 2	Blue	846.0	823.0	810.0	710	59.0	49.0
* Assumes a new 1.5 million gal tank (head range=46') ground elevation @ tank = 700					700	63.4	53.4	47.7
					690	67.7	57.7	52.1
					680	72.0	62.1	56.4
					670	76.4	66.4	60.8
					660	80.7	70.7	65.1
					650	85.1	75.1	69.4

G:\Public\SUGARGRO\2002\SG0235 Water Works Feasibility Study\Water Analysis\Waterworks Workbook - 2030 NIPC Projections (PF=2.1).xls|Table 4 - Pressure Zones

3.2 Water Supply and Treatment

The required water supply capacity for the proposed developments was derived from the analysis of two parameters. These parameters and their corresponding descriptions are listed below.

1. *Ultimate Source Capacity* – The system’s ability to supply the maximum day demand with the largest well out of service.
2. *Reliable Source Capacity* – The system’s ability to supply the maximum day demand with all wells operating 18 hours per day.

Reliable Source Capacity arises as the controlling scenario, with a required capacity of 4,051 gpm. Note that approximately 5,143 PE are served by 1,000 gpm of capacity. Refer to Table No. 7 for the analysis of each scenario.

**Table No. 7: Water Supply Capacity
 Village of Sugar Grove, Kane County, Illinois
 Immediate Development (Maximum Day:Average Day = 2.1)**

Controlling Scenario Of Water Supply

Scenario	Minimum Water Supply Capacity (gpm)
Ultimate Source	4,038
Reliable Source	4,051

Calculation Per Scenario Of Water Supply

Scenario	Calculation Of Minimum Water Supply Capacity (Gpm)
Ultimate Source	Max. Day Demand = 4,374,951 Gallons/Day x (1 Day / 24 Hours) x (1 Hour / 60 Minutes) = 3,038 gpm Ultimate Source = Max Day Demand + largest well = 3,038 gpm + 1000 gpm = 4,038 gpm
Reliable Source	4,374,951 Gallons / (18 Hours x (1 Day / 24 Hours)) = 5,833,268 Gallons/Day 5,833,268 Gallons/Day x (1 Day / 24 Hours) x (1 Hour / 60 Minutes) = 4,051 gpm

G:\Public\SUGARGRO\2002\SG0235 Water Works Feasibility Study\Water Analysis\Waterworks Workbook - Immediate Development (PF=2.1).xls]Table 7 - Water Supply Capacity

- Note: -- Denotes Controlling Scenario Of Water Supply.
- Recommended Water Supply Capacity = 4,051 gpm.
 - Ultimate Source Capacity = The system’s ability to supply the maximum day demand with the largest well out of service.
 - Reliable Source Capacity = The system’s ability to supply the maximum day demand with all wells operating 18 hours per day.
 - Average Day Demand = 2,083,310 Gallons/Day
 - Maximum Day Demand = 4,374,951 Gallons/Day
 - Peak Hourly Demand = 8,749,902 Gallons/Day

3.2.1 Potential Water Sources and Water Source Studies

Two potential source water resources that can be utilized for potable water supply as the Village continues to grow are deep groundwater and shallow groundwater. The St. Peter sandstone and the Ironton-Galesville sandstone formations are deep sandstone water bearing formations underlying Kane County (with depths of 650 to 750 feet and 800 to 1,100 feet, respectively) and are viable formations for deep groundwater wells. The St. Charles and Aurora Bedrock Valley aquifers provide the potential for sustainable shallow groundwater wells. These valleys are located immediately above bedrock, which ranges in depth from less than 1 foot to 300 feet. The St. Charles Bedrock Valley aquifer is more prolific and wells into this formation are likely to have a higher yield than those in the Aurora Bedrock Valley.

Deep wells are typically considered as the most viable supply source for communities throughout Kane County. However, as the population continues to climb in northeastern Illinois, the demand on the deep aquifers continues to increase. For that reason, it is difficult to forecast the future availability and productivity of the deep sandstone aquifers. The Village has made a commitment to identify and protect potential future shallow groundwater resources such that the land uses in these areas can be established to accommodate accessibility to the shallow groundwater. This will allow the Village to integrate shallow and deep groundwater resources into their water works system.

The Village contracted with Layne Christensen Company (Layne) to conduct a geophysical exploration to identify potential locations for the construction of shallow groundwater wells. Layne initially surveyed four areas in December 2003 to help determine the extent of the shallow aquifer bedrock valleys. These areas were surveyed using electrical resistivity and seismic techniques. The areas surveyed were: south of Harter Road, approximately 2,500 feet west of

Route 47, on the Kaneville School District site; north of Prairie Street, approximately 4,500 feet east of Route 47, on the proposed Neumann Homes site; north and south of Prairie Street, approximately 2,100 feet west of Route 47, on the Settlers Ridge site; and south of Prairie Street, approximately 5,000 feet west of Route 47, on the Settlers Ridge site. To better establish the location of the bedrock valleys, Layne then did one additional survey south of Prairie Street, approximately 4,500 feet east of Route 47, continuing the resistivity line conducted on the proposed Neumann Homes site, and one additional survey south of Harter Road, approximately 2,500 feet west of Route 47, continuing the resistivity line conducted on the Kaneville School District site.

After the initial surveys were performed, Layne identified specific locations where they recommended drilling exploratory test holes to confirm the results of the surveys, and the location of the bedrock valleys. In April 2004, Layne drilled one test hole at the Kaneville School District site, and three test holes at the Neumann Homes site. While the school site results did not identify the axis of the bedrock valley, the test holes drilled at the Neumann Homes site identified potential prime locations within the Aurora Bedrock Valley.

Layne conducted additional field surveys in May 2004 to identify the axis of the St. Charles Bedrock Valley near the Kaneland School District site and the Aurora Bedrock Valley on the Settlers Ridge site. These surveys identified one primary and one secondary exploratory test hole location at each site. Once the additional test borings have been completed, Layne will identify areas where they recommend additional exploratory test holes and/or test wells. It is expected that test wells will confirm the presence of suitable sand and gravel formations and the viability of providing an adequate volume of groundwater (at least 400 to 500 gpm) from the bedrock valley at a specific location or locations.

3.2.2 Recommended Supply and Treatment

It is recommended that the Village use a combination of shallow and deep groundwater wells to meet the demand noted above. Shallow groundwater wells should be preferentially installed, with deep well used to supplement the required demand of 4,051 gpm. Six shallow wells with capacities of at least 500 gpm and one deep well with a capacity of 1,000 gpm will meet the expected demand from the currently proposed developments. Alternately, four shallow wells with capacities of at least 500 gpm and two deep wells with a capacity of 1,000 gpm each will meet the expected demand. The ultimate ratio of shallow and deep groundwater wells will be dependent on the finding of Layne's geophysical explorations.

Based on review of the water quality of the existing deep wells in Sugar Grove, additional deep groundwater wells will require treatment to remove radium. Shallow groundwater can be expected to require treatment for the removal of iron and manganese and sometimes hydrogen sulfide. The Village of Sugar Grove has already made a commitment to remove combined radium and lower the hardness to more acceptable levels by implementing cation exchange treatment for the existing deep groundwater wells. Therefore, additional supply sources would require an equivalent level of treatment to provide a consistent water quality in the public water supply – likely also using cation exchange. In the instance where hydrogen sulfide treatment is required, an oxidation/precipitation/filtration system must be installed prior to the cation exchange treatment system.

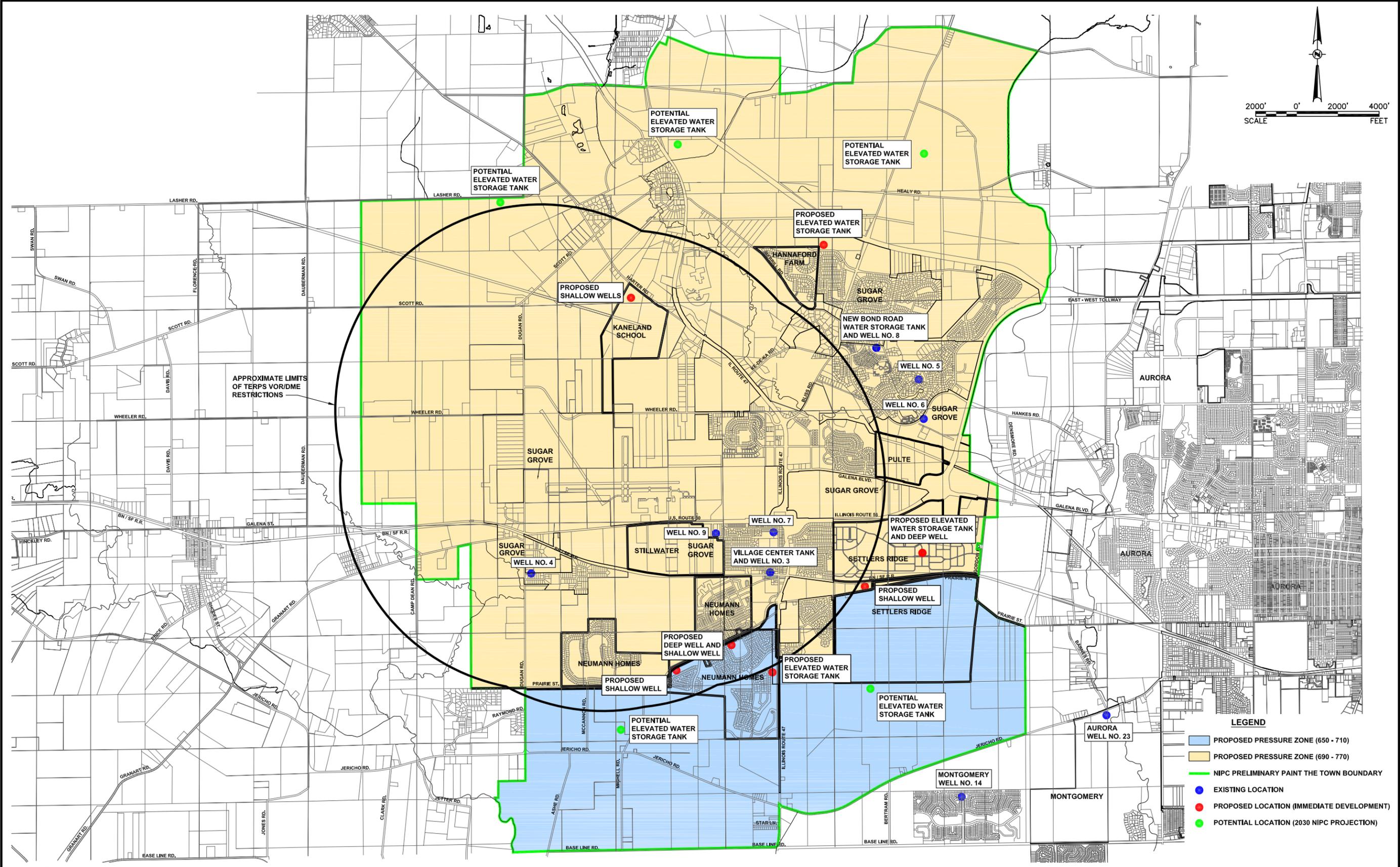
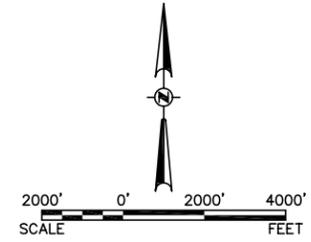
It is possible to treat the water from multiple wells at one treatment facility. However, to provide redundancy and security to the water works system, and to allow for future expansion, it is recommended that at least three new treatment facilities be constructed. Each facility can be located adjacent to a well and a raw water main can be used to route water from any nearby wells to one of the facilities for treatment. Multiple facilities will allow for greater flexibility in

operations; each facility could be taken on- or off-line, independently of each of the other facilities.

Because each well will draw down the water table in a localized area, it is important to space each deep well at least ½ mile from any other deep well and that each shallow well be at least 1,000 feet from any other shallow well. Preliminary locations for the wells were sited so they would not interfere with existing wells or each other. Exhibit E shows the ½ mile radius of influence for each existing and proposed deep well.

3.3 Water Distribution

It is recommended that a grid system of 12-inch and 16-inch water main be used to provide sufficient fire flow and pressure through out the water distribution system. To maintain a fire flow of 3,000 gallons/minute, a 16-inch water main will be necessary. Additional water main looping may be required, to sustain adequate fire flow and pressure for each pressure zone. Additionally, 16-inch water main will be necessary to allow for the transfer of water between each pressure zone and elevated water storage tank. The water distribution system requirements will be reviewed further during the planning process for each proposed development. The basis of the system is shown on Exhibit D. The recommended water main improvements for the immediate proposed developments are shown on Exhibit F.



- LEGEND**
- PROPOSED PRESSURE ZONE (650 - 710)
 - PROPOSED PRESSURE ZONE (690 - 770)
 - NIPC PRELIMINARY PAINT THE TOWN BOUNDARY
 - EXISTING LOCATION
 - PROPOSED LOCATION (IMMEDIATE DEVELOPMENT)
 - POTENTIAL LOCATION (2030 NIPC PROJECTION)

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 Civil Engineers & Land Surveyors
 52 Wheeler Road
 Sugar Grove, Illinois 60554 630/466-9350

VILLAGE OF SUGAR GROVE KANE COUNTY, ILLINOIS		
NO.	DATE	REVISIONS

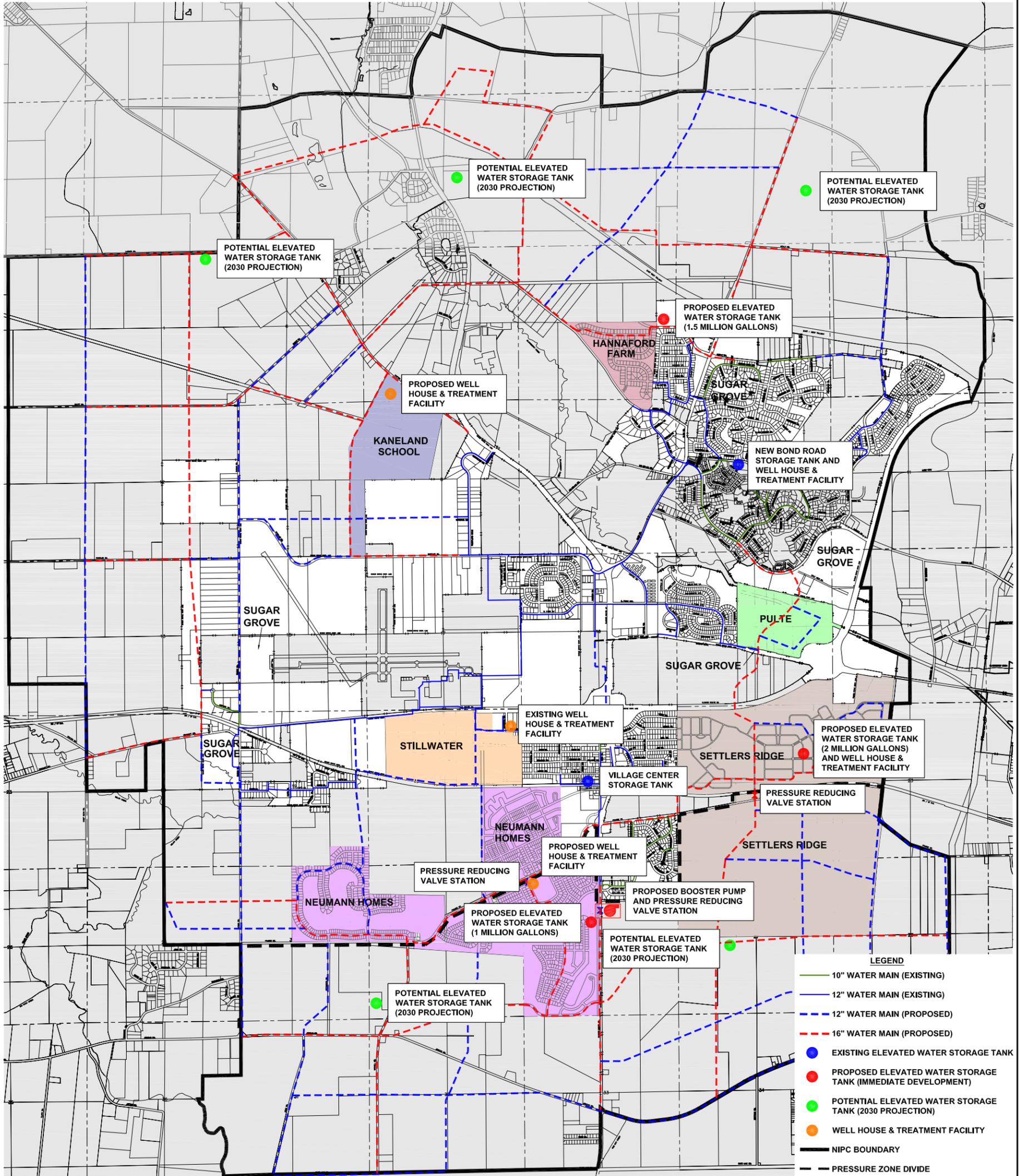
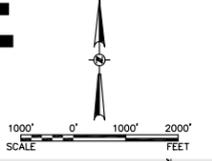
**WATER WORKS SYSTEM
NEEDS ASSESSMENT**

**PROPOSED PRESSURE ZONES WITH
POTENTIAL ELEVATED STORAGE
TANK LOCATIONS**

DATE JUNE 2004
 PROJ. NO. SG0235
 FILE. NO. SG040025
 EXHIBIT C

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VILLAGE OF SUGAR GROVE WATER DISTRIBUTION SYSTEM



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70 1st STREET
SUGAR GROVE, ILLINOIS 60554

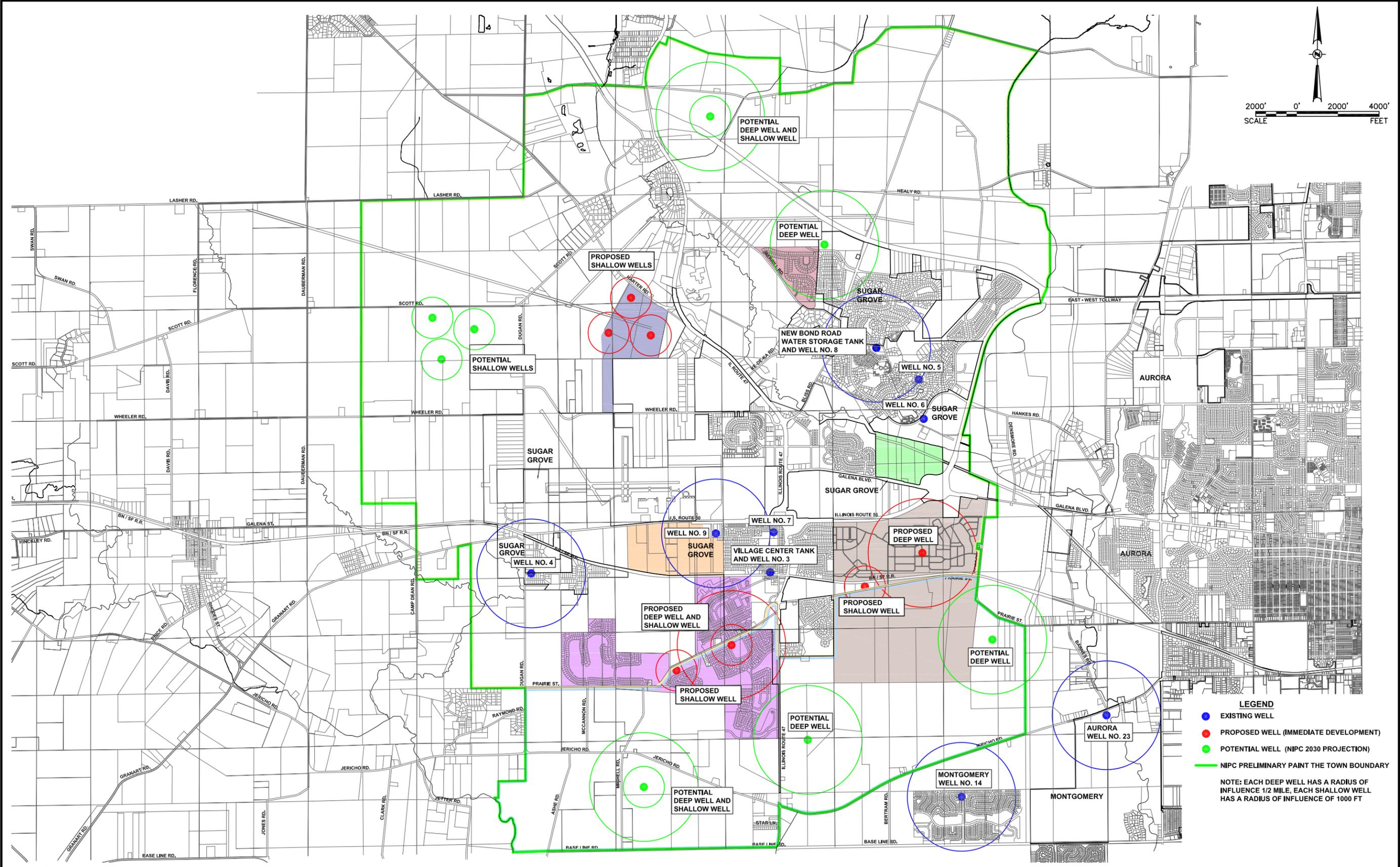
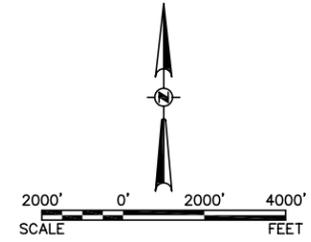
NO.	DATE	REVISIONS

WATER WORKS SYSTEM
NEEDS ASSESSMENT

PROPOSED WATER DISTRIBUTION SYSTEM
(NIPC PLANNING AREA)
VILLAGE OF SUGAR GROVE & PRESTBURY

DATE: JUNE 2004
PROJ. NO.: SG0235
FILE NO.: SG040031
EXHIBIT D

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LEGEND

- EXISTING WELL
- PROPOSED WELL (IMMEDIATE DEVELOPMENT)
- POTENTIAL WELL (NIPC 2030 PROJECTION)
- NPC PRELIMINARY PAINT THE TOWN BOUNDARY

NOTE: EACH DEEP WELL HAS A RADIUS OF INFLUENCE 1/2 MILE, EACH SHALLOW WELL HAS A RADIUS OF INFLUENCE OF 1000 FT

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VILLAGE OF SUGAR GROVE
 KANE COUNTY, ILLINOIS

NO.	DATE	REVISIONS

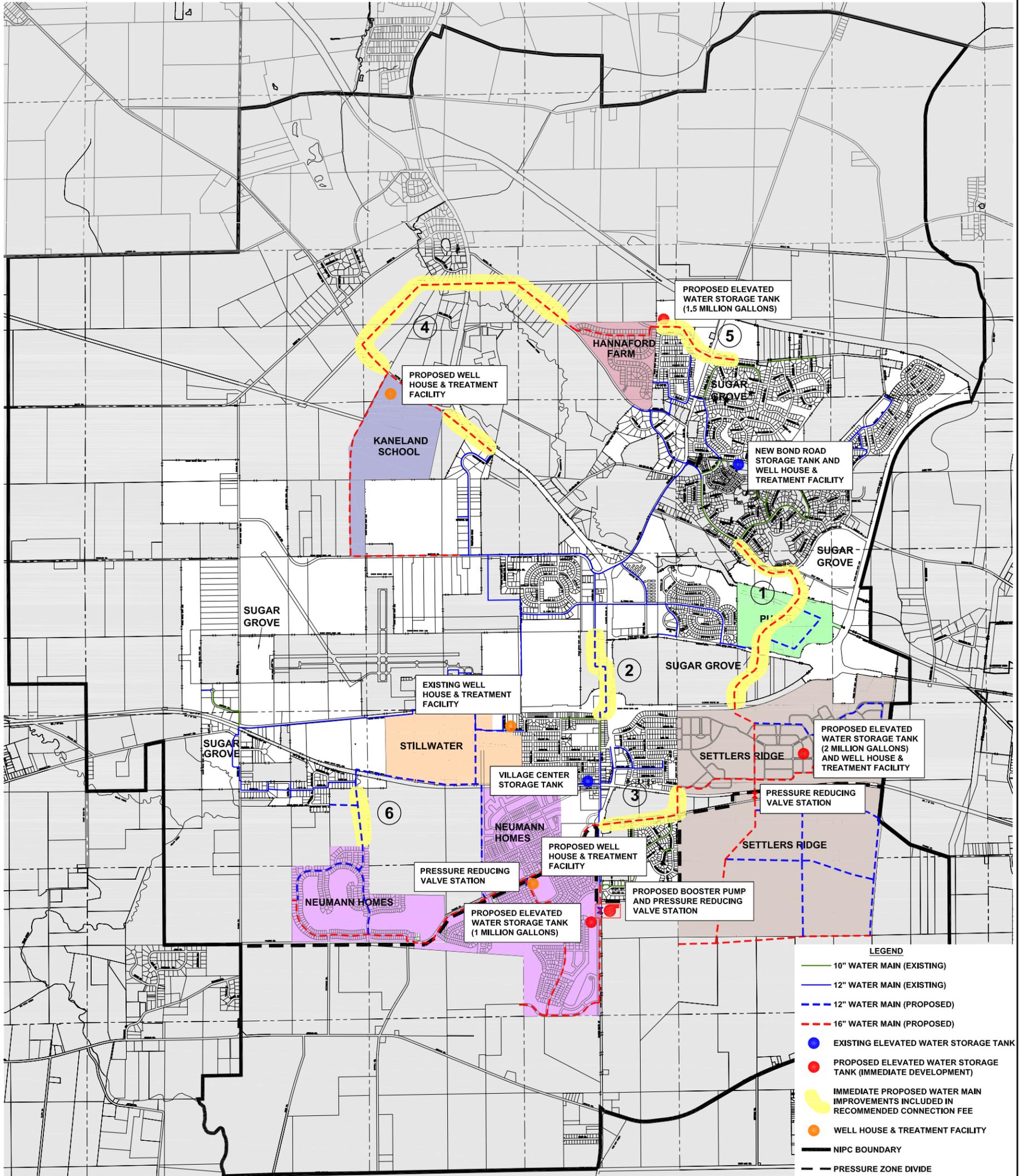
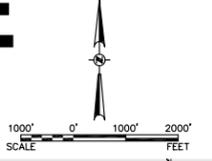
WATER WORKS SYSTEM
NEEDS ASSESSMENT

RADIUS OF INFLUENCE PER WELL
AND POTENTIAL FUTURE WATER
WELL LOCATIONS

DATE JUNE 2004
 PROJ. NO. SG0235
 FILE. NO. SGO40026
EXHIBIT E

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VILLAGE OF SUGAR GROVE WATER DISTRIBUTION SYSTEM



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SUGAR GROVE, ILLINOIS 60554

NO.	DATE	REVISIONS

WATER WORKS SYSTEM
NEEDS ASSESSMENT

PROPOSED WATER DISTRIBUTION SYSTEM
(IMMEDIATE PROPOSED DEVELOPMENT)
VILLAGE OF SUGAR GROVE & PRESTBURY

DATE: JULY 2004
PROJ. NO.: SG0235
FILE NO.: SG040034
EXHIBIT F

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Section 4 – Financial Analysis

4.1 Estimated Construction Costs

As previously noted, construction costs for the 2030 population projection are not provided at this time due to the large magnitude of the study area.

Based on 2004 construction costs, the total cost of recommended water works system improvements in the near future is approximately \$27.59 million, which includes \$24.66 million for the immediate proposed developments, \$1.71 million for existing Village needs, and \$1.23 million for oversizing the north tank.

This \$27.59 million for these proposed developments equates to \$1,325 per population equivalent. The breakdown of costs is summarized in Table No. 2.

The Village currently has a 0.63 MG water storage deficit, and 4-inch water mains need to be replaced to achieve the necessary fire flows. We also recommend that the Village Center tank (0.20 MG) be removed, and that this water storage be replaced within the proposed elevated storage tank located in the Settlers Ridge subdivision. In addition, we recommend that the Village provide a larger storage tank in the north than what is required by the immediate proposed developments. With limited storage tank locations to serve the central area of the Village, we recommend that the tank just north of Hannaford Farm be a minimum of a 1.5 MG tank.

Table No. 3 provides a summary of the total estimated costs for the water works system improvements for the immediate proposed developments, which includes water main improvements, booster pump/pressure reducing valve station, pressure reducing valve stations, wells, water treatment facilities, and elevated storage tanks. Refer to Appendix A for detail cost estimates of the individual

water works system improvements for the immediate proposed developments. Refer to Table No. 2 for a breakdown of construction costs per population equivalent and Appendix B for a breakdown by development.

All cost estimates include engineering fees, land acquisition fees, legal fees, material testing fees, and surveying fees. All values are based upon 2004 construction costs.

Appendix A: Cost Estimates for Water Works System Improvements

**COST ESTIMATE SUMMARY FOR 2 - 500 GPM WELLS &
WELL HOUSE AND TREATMENT FACILITY**
Village of Sugar Grove, Kane County, Illinois

ITEM NO.	ITEM	AMOUNT
1	2 - 500 GPM WELLS	
	Construction (Casing, Hole, Grout, Etc.)	\$300,000
	Development (Disinfection, Testing, Etc.)	\$150,000
	Equipment (Pump/Motor, Pitless Adapter, Etc.)	\$150,000
	Raw Water Main (3,800')	\$285,000
2	WELL HOUSE AND TREATMENT BUILDING (80' X 31' & 32' X 26')	
	Structures (Building and Surge Tank)	\$819,760
	Equipment (Chemical Feed, Brine, Wet Well, and WW Pumps, Etc.)	\$86,000
	Miscellaneous Piping and Meters	\$130,000
3	TREATMENT EQUIPMENT	
	Cation Exchange Equipment (4 - 7' Diameter Units)	\$415,800
	Iron Removal Equipment (1 - 20.5' Diameter Unit)	\$263,000
4	SALT STORAGE TANK	\$60,000
5	ELECTRICAL	
	Power Distribution	\$224,077
	Controls	\$224,077
	Emergency Generator	\$60,000
6	SCADA INTEGRATION	\$37,500
7	YARD PIPING AND SITE WORK	\$145,000
8	LANDSCAPING	\$20,000
	SUB-TOTAL	\$3,370,200
	CONTINGENCY (10%)	\$337,000
	TOTAL ESTIMATED COST OF CONSTRUCTION	\$3,707,200
	ENGINEERING (15%)	\$556,000
	SOIL AND MATERIAL TESTING	\$5,000
	TOTAL ESTIMATED COST OF PROJECT	\$4,268,200

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**COST ESTIMATE SUMMARY FOR 1 - 1,000 GPM WELL &
ONE WELL HOUSE AND TREATMENT FACILITY**
Village of Sugar Grove, Kane County, Illinois

ITEM NO.	ITEM	AMOUNT
1	1 - 1,000 GPM WELL	
	Construction (Casing, Hole, Grout, Etc.)	\$530,000
	Development (Disinfection, Testing, Etc.)	\$100,000
	Equipment (Pump/Motor, Pitless Adapter, Etc.)	\$180,000
2	WELL HOUSE AND TREATMENT BUILDING (48' X 28' & 32' X 26')	
	Structures (Building and Surge Tank)	\$459,280
	Equipment (Chemical Feed, Brine and WW Pumps, Etc.)	\$60,000
	Miscellaneous Piping and Meters	\$150,000
3	TREATMENT EQUIPMENT	
	Cation Exchange Equipment (3 - 8' Diameter Units)	\$415,800
4	SALT STORAGE TANK	\$60,000
5	ELECTRICAL	
	Power Distribution	\$180,409
	Controls	\$180,409
	Emergency Generator	\$325,000
6	SCADA INTEGRATION	\$25,000
7	YARD PIPING AND SITE WORK	\$130,000
8	LANDSCAPING	\$15,000
	SUB-TOTAL	\$2,810,900
	CONTINGENCY (10%)	\$281,000
	TOTAL ESTIMATED COST OF CONSTRUCTION	\$3,091,900
	ENGINEERING (15%)	\$463,800
	SOIL AND MATERIAL TESTING	\$5,000
	TOTAL ESTIMATED COST OF PROJECT	\$3,560,700

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COST ESTIMATE
2 MILLION GALLON TANK
Village of Sugar Grove, Kane County, Illinois

ITEM NO.	ITEM	AMOUNT
1	Elevated Water Storage Tank (2 Million Gallons) (105 feet to the BCL)	\$2,425,000
2	Yard Piping and Site Work	\$150,000
3	SCADA Implementation	\$25,000
	SUB-TOTAL	\$2,600,000
	CONTINGENCY (10%)	\$260,000
	TOTAL ESTIMATED COST OF CONSTRUCTION	\$2,860,000
	ENGINEERING (7%)	\$182,000
	SOIL AND MATERIAL TESTING	\$15,000
	TOTAL ESTIMATED COST OF PROJECT	\$3,057,000

Note -- All values are based on 2004 construction costs.

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COST ESTIMATE
1.5 MILLION GALLON TANK
Village of Sugar Grove, Kane County, Illinois

ITEM NO.	ITEM	AMOUNT
1	Elevated Water Storage Tank (1.5 Million Gallons) (100 feet to the BCL)	\$1,850,000
2	Yard Piping and Site Work	\$150,000
3	SCADA Implementation	\$25,000
	SUB-TOTAL	\$2,025,000
	CONTINGENCY (10%)	\$203,000
	TOTAL ESTIMATED COST OF CONSTRUCTION	\$2,228,000
	ENGINEERING (7%)	\$142,000
	SOIL AND MATERIAL TESTING	\$15,000
	TOTAL ESTIMATED COST OF PROJECT	\$2,385,000

Note -- All values are based on 2004 construction costs.

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COST ESTIMATE
1 MILLION GALLON TANK
Village of Sugar Grove, Kane County, Illinois

ITEM NO.	ITEM	AMOUNT
1	Elevated Water Storage Tank (1 Million Gallons) (100 feet to the BCL)	\$1,350,000
2	Yard Piping and Site Work	\$150,000
3	SCADA Implementation	\$25,000
	SUB-TOTAL	\$1,525,000
	CONTINGENCY (10%)	\$153,000
	TOTAL ESTIMATED COST OF CONSTRUCTION	\$1,678,000
	ENGINEERING (7%)	\$107,000
	SOIL AND MATERIAL TESTING	\$15,000
	TOTAL ESTIMATED COST OF PROJECT	\$1,800,000

Note -- All values are based on 2004 construction costs.

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COST ESTIMATE
BOOSTER PUMP AND PRV STATION
Village of Sugar Grove, Kane County, Illinois

ITEM NO.	ITEM	AMOUNT
1	Booster Pumping / Pressure Reducing Valve Station	\$ 225,000.00
2	Generator	\$35,000
3	Architectural Components	\$30,000
4	SCADA Implementation	\$25,000
5	Yard Piping and Site Work	\$90,000
	SUB-TOTAL	\$405,000
	CONTINGENCY (5%)	\$20,000
	TOTAL ESTIMATED COST OF CONSTRUCTION	\$425,000
	ENGINEERING (15%)	\$61,000
	SOIL AND MATERIAL TESTING	\$10,000
	TOTAL ESTIMATED COST OF PROJECT	\$496,000

Note -- All values are based on 2004 construction costs.

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COST ESTIMATE
PRESSURE REDUCING VALVE STATION
Village of Sugar Grove, Kane County, Illinois

ITEM NO.	ITEM	AMOUNT
1	Booster Pumping / Pressure Reducing Valve Station	\$ 80,000.00
2	SCADA Implementation	\$25,000
3	Yard Piping and Site Work	\$60,000
	SUB-TOTAL	\$165,000
	CONTINGENCY (5%)	\$8,000
	TOTAL ESTIMATED COST OF CONSTRUCTION	\$173,000
	ENGINEERING (15%)	\$25,000
	SOIL AND MATERIAL TESTING	\$10,000
	TOTAL ESTIMATED COST OF PROJECT	\$208,000

Note -- All values are based on 2004 construction costs.

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SUMMARY OF WATER MAIN IMPROVEMENTS
Village of Sugar Grove, Kane County, Illinois

Item No.	Item	Amount
1	Settlers Ridge to Prestbury	\$ 764,000.00
2	Route 47 - 12" Connection	231,650.00
3	Settlers to Rolling Oaks to Neumann Homes	501,200.00
4	Hannaford Farm to School Site	1,138,440.00
5	Tank in North to Prestbury	313,350.00
6	Clublands to Whispering Oaks	158,050.00
Sub-total		\$ 3,106,690.00

Notes: -- Cost Estimate Only Includes Offsite Large Diameter Watermain.
-- All values are based on 2004 construction costs.
-- Refer to Exhibit F for a map of the proposed water main improvements.

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Off-Site Water Main Cost - Item No. 1
Looping Water Main
from Prestbury to Northern Property Line of Settlers Ridge
Village of Sugar Grove, Kane County, Illinois

Item No.	Item	Unit	Quantity	Unit Cost	Amount
1	Topsoil Stripping, Piling, and Replacing	Lump Sum	1	\$ 20,000.00	\$ 20,000.00
2	Connection To Existing 16-Inch Water Main	Each	1	1,000.00	\$ 1,000.00
3	Connection To Existing 10-Inch Water Main	Each	2	1,000.00	\$ 2,000.00
4	Connection To Existing 6-Inch Water Main	Each	3	1,000.00	\$ 3,000.00
5	Water Main, 16-Inch Class 52, D.I.P.	Foot	8,500	42.00	357,000.00
6	Gate Valve & Valve Vault, 16-Inch (Resilient Seat) In A 60-Inch Vault	Each	10	4,000.00	40,000.00
7	Fire Hydrant Assembly, 6-Inch MJ	Each	10	2,000.00	20,000.00
8	Ductile Iron Fittings	Lump Sum	1	8,000.00	8,000.00
7	Bore and Jack 30-Inch Steel Casing Pipe with a 0.375-Inch Wall Thickness	Foot	390	300.00	117,000.00
9	Foundation Material	Cu. Yd.	400	25.00	10,000.00
10	Watermain Testing - Pressure and Disinfection	Lump Sum	1	10,000.00	10,000.00
11	Restoration	Lump Sum	1	10,000.00	10,000.00
12	Traffic Control	Lump Sum	1	2,000.00	2,000.00
Sub-total					\$ 600,000.00
Contingency (10%)					60,000.00
Total Estimated Cost Of Construction					\$ 660,000.00
Engineering					99,000.00
Legal And Administrative Fees					2,500.00
Soil And Material Testing					2,500.00
Total Estimated Cost Of Project					\$ 764,000.00

Notes: -- Cost Estimate Only Includes Offsite Large Diameter Watermain.
-- All values are based on 2004 construction costs.
-- Refer to Exhibit F for a map of the proposed water main improvements.

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Table No. 2: Cost Estimate For Connecting Water Main from Windsor Point to the Proposed 16" Loop from Settlers Ridge Village of Sugar Grove, Kane County, Illinois

Item No.	Item	Unit	Quantity	Unit Cost	Amount
1	Topsoil Stripping, Piling, and Replacing	Lump Sum	1	\$ 3,000.00	\$ 3,000.00
2	Connection To Existing 12-Inch Water Main	Each	1	\$ 1,000.00	\$ 1,000.00
3	Connection To Existing 16-Inch Water Main	Each	1	\$ 1,000.00	\$ 1,000.00
4	Water Main, 12-Inch Class 52, D.I.P.	Foot	2,250	40.00	90,000.00
5	Gate Valve & Valve Vault, 12-Inch (Resilient Seat) in a 60-Inch Vault	Each	3	4,000.00	12,000.00
6	Fire Hydrant Assembly, 6-Inch MJ	Each	3	2,000.00	6,000.00
7	Ductile Iron Fittings	Lump Sum	1	1,000.00	1,000.00
8	Bore and Jack 30-Inch Steel Casing Pipe with a 0.375-Inch Wall Thickness	Foot	200	300.00	60,000.00
9	Foundation Material	Cu. Yd.	50	25.00	1,250.00
10	Watermain Testing - Pressure and Disinfection	Lump Sum	1	2,000.00	2,000.00
11	Restoration	Lump Sum	1	2,000.00	2,000.00
Sub-total					\$ 179,250.00
Contingency (10%)					<u>17,900.00</u>
Total Estimated Cost Of Construction					\$ 197,150.00
Engineering					29,500.00
Legal And Administrative Fees					2,500.00
Soil And Material Testing					<u>2,500.00</u>
Total Estimated Cost Of Project					\$ 231,650.00

Note: -- Cost Estimate Only Includes Offsite Large Diameter Watermain.

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Off-Site Water Main Cost - Item No. 3
Looping Water Main
from Town to Rolling Oaks to Route 47
Village of Sugar Grove, Kane County, Illinois

Item No.	Item	Unit	Quantity	Unit Cost	Amount
1	Topsoil Stripping, Piling, and Replacing	Lump Sum	1	\$ 5,000.00	\$ 5,000.00
2	Connection To Existing 16-Inch Water Main	Each	1	1,000.00	\$ 1,000.00
3	Connection To Existing 12-Inch Water Main	Each	1	1,000.00	\$ 1,000.00
4	Connection To Existing 10-Inch Water Main	Each	2	1,000.00	\$ 2,000.00
5	Water Main, 16-Inch Class 52, D.I.P.	Foot	5,730	40.00	229,200.00
6	Butterfly Valve & Valve Vault, 16-Inch (Resilient Seat) In A 60-Inch Vault	Each	7	4,000.00	28,000.00
7	Fire Hydrant Assembly, 6-Inch MJ	Each	7	2,000.00	14,000.00
8	Ductile Iron Fittings	Lump Sum	1	5,700.00	5,700.00
9	Bore and Jack 30-Inch Steel Casing Pipe with a 0.375-Inch Wall Thickness	Foot	298	300.00	89,400.00
10	Foundation Material	Cu. Yd.	200	25.00	5,000.00
11	Watermain Testing - Pressure and Disinfection	Lump Sum	1	5,000.00	5,000.00
12	Restoration	Lump Sum	1	5,000.00	5,000.00
13	Traffic Control	Lump Sum	1	2,000.00	2,000.00
Sub-total					\$ 392,300.00
Contingency (10%)					39,200.00
Total Estimated Cost Of Construction					\$ 431,500.00
Engineering					64,700.00
Legal And Administrative Fees					2,500.00
Soil And Material Testing					2,500.00
Total Estimated Cost Of Project					\$ 501,200.00

Notes: -- Cost Estimate Only Includes Offsite Large Diameter Watermain.
-- All values are based on 2004 construction costs.
-- Refer to Exhibit F for a map of the proposed water main improvements.

Off-Site Water Main Cost - Item No. 4
Looping Water Main
from Tank in the North to Kaneland Community School to Heartland Drive
Village of Sugar Grove, Kane County, Illinois

Item No.	Item	Unit	Quantity	Unit Cost	Amount
1	Topsoil Stripping, Piling, and Replacing	Lump Sum	1	\$ 15,000.00	\$ 15,000.00
2	Connection To Existing 12-Inch Water Main	Each	1	\$ 1,000.00	\$ 1,000.00
3	Connection To Existing 16-Inch Water Main	Each	3	\$ 1,000.00	\$ 3,000.00
4	Water Main, 16-Inch Class 52, D.I.P.	Foot	13,470	42.00	565,740.00
5	Gate Valve & Valve Vault, 16-Inch (Resilient Seat) in a 60-Inch Vault	Each	28	4,000.00	112,000.00
6	Fire Hydrant Assembly, 6-Inch MJ	Each	28	2,000.00	56,000.00
7	Ductile Iron Fittings	Lump Sum	1	14,000.00	14,000.00
8	Bore and Jack 30-Inch Steel Casing Pipe with a 0.375-Inch Wall Thickness	Foot	276	300.00	82,800.00
9	Foundation Material	Cu. Yd.	700	25.00	17,500.00
10	Watermain Testing - Pressure and Disinfection	Lump Sum	1	12,000.00	12,000.00
11	Restoration	Lump Sum	1	15,000.00	15,000.00
12	Traffic Control	Lump Sum	1	2,000.00	2,000.00
Sub-total					\$ 896,040.00
Contingency (10%)					<u>89,600.00</u>
Total Estimated Cost Of Construction					\$ 985,640.00
Engineering					147,800.00
Legal And Administrative Fees					2,500.00
Soil And Material Testing					<u>2,500.00</u>
Total Estimated Cost Of Project					\$ 1,138,440.00

Notes: -- Cost Estimate Only Includes Offsite Large Diameter Watermain.
-- All values are based on 2004 construction costs.
-- Refer to Exhibit F for a map of the proposed water main improvements.

Off-Site Water Main Cost - Item No. 5
Looping Water Main
from the Proposed Tank in the North Along Denny Road to Prestbury
Village of Sugar Grove, Kane County, Illinois

Item No.	Item	Unit	Quantity	Unit Cost	Amount
1	Topsoil Stripping, Piling, and Replacing	Lump Sum	1	\$ 5,000.00	\$ 5,000.00
2	Connection To Existing 16-Inch Water Main	Each	1	1,000.00	\$ 1,000.00
3	Connection To Existing 12-Inch Water Main	Each	1	1,000.00	\$ 1,000.00
4	Connection To Existing 10-Inch Water Main	Each	1	1,000.00	\$ 1,000.00
5	Water Main, 16-Inch Class 52, D.I.P.	Foot	3,650	40.00	146,000.00
6	Butterfly Valve & Valve Vault, 16-Inch (Resilient Seat) In A 60-Inch Vault	Each	5	4,000.00	20,000.00
7	Fire Hydrant Assembly, 6-Inch MJ	Each	5	2,000.00	10,000.00
8	Ductile Iron Fittings	Lump Sum	1	3,500.00	3,500.00
9	Bore and Jack 30-Inch Steel Casing Pipe with a 0.375-Inch Wall Thickness	Foot	132	300.00	39,600.00
10	Foundation Material	Cu. Yd.	250	25.00	6,250.00
11	Watermain Testing - Pressure and Disinfection	Lump Sum	1	3,500.00	3,500.00
12	Restoration	Lump Sum	1	5,000.00	5,000.00
13	Traffic Control	Lump Sum	1	2,000.00	2,000.00
Sub-total					\$ 243,850.00
Contingency (10%)					24,300.00
Total Estimated Cost Of Construction					\$ 268,150.00
Engineering					40,200.00
Legal And Administrative Fees					2,500.00
Soil And Material Testing					2,500.00
Total Estimated Cost Of Project					\$ 313,350.00

Notes: -- Cost Estimate Only Includes Offsite Large Diameter Watermain.
-- All values are based on 2004 construction costs.
-- Refer to Exhibit F for a map of the proposed water main improvements.

Off-Site Water Main Cost - Item No. 6
Looping Water Main
for Looping Water Main from Clublands to Whispering Oak
Village of Sugar Grove, Kane County, Illinois

Item No.	Item	Unit	Quantity	Unit Cost	Amount
1	Topsoil Stripping, Piling, and Replacing	Lump Sum	1	\$ 5,000.00	\$ 5,000.00
1	Connection To Existing 12-Inch Water Main	Each	1	\$ 1,000.00	\$ 1,000.00
2	Water Main, 12-Inch Class 52, D.I.P.	Foot	2,025	42.00	85,050.00
3	Gate Valve & Valve Vault, 12-Inch (Resilient Seat) in a 60-Inch Vault	Each	3	4,000.00	12,000.00
4	Fire Hydrant Assembly, 6-Inch MJ	Each	3	2,000.00	6,000.00
5	Ductile Iron Fittings	Lump Sum	1	2,000.00	2,000.00
6	Foundation Material	Cu. Yd.	100	25.00	2,500.00
7	Watermain Testing - Pressure and Disinfection	Lump Sum	1	2,500.00	2,500.00
8	Restoration	Lump Sum	1	5,000.00	5,000.00
Sub-total					\$ 121,050.00
Contingency (10%)					12,100.00
Total Estimated Cost Of Construction					\$ 133,150.00
Engineering					19,900.00
Legal And Administrative Fees					2,500.00
Soil And Material Testing					2,500.00
Total Estimated Cost Of Project					\$ 158,050.00

Notes: -- Cost Estimate Only Includes Offsite Large Diameter Watermain.
-- All values are based on 2004 construction costs.
-- Refer to Exhibit F for a map of the proposed water main improvements.

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Cost Estimate
Replacing 4" Water Main in the Town Center
Village of Sugar Grove, Kane County, Illinois

Item No.	Item	Unit	Quantity	Unit Cost	Amount
1	Topsoil Stripping, Piling, and Replacing	Lump Sum	1	\$ 5,000.00	\$ 5,000.00
2	Trench Backfill	Cu. Yd.	1,469	20.00	29,376.00
3	Connection To Existing 12-Inch Water Main	Each	4	1,000.00	\$ 4,000.00
4	Connection To Existing 6-Inch Water Main	Each	3	1,000.00	\$ 3,000.00
5	Water Main, 8-Inch Class 52, D.I.P.	Foot	2,160	38.00	82,080.00
6	Gate Valve & Valve Vault, 8-Inch (Resilient Seat) in a 48-Inch Vault	Each	7	4,000.00	28,000.00
7	Fire Hydrant Assembly, 6-Inch MJ	Each	7	2,000.00	14,000.00
8	Ductile Iron Fittings	Lump Sum	1	4,000.00	4,000.00
9	Water Service Connections	Each	30	1,000.00	30,000.00
9	Foundation Material	Cu. Yd.	100	25.00	2,500.00
10	Watermain Testing - Pressure and Disinfection	Lump Sum	1	5,000.00	5,000.00
11	Pavement Removal and Replacement	Sq. Yd.	1,940	30.00	58,212.00
11	Restoration	Lump Sum	1	2,500.00	2,500.00
12	Traffic Control	Lump Sum	1	2,000.00	2,000.00
Sub-total					\$ 269,668.00
Contingency (10%)					26,900.00
Total Estimated Cost Of Construction					\$ 296,568.00
Engineering					44,400.00
Legal And Administrative Fees					2,500.00
Soil And Material Testing					2,500.00
Total Estimated Cost Of Project					\$ 345,968.00

Note: -- All values are based on 2004 construction costs.

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**COST ESTIMATE SUMMARY FOR 3 - 500 GPM WELLS &
WELL HOUSE AND TREATMENT FACILITY**
Village of Sugar Grove, Kane County, Illinois

ITEM NO.	ITEM	AMOUNT
1	3 - 500 GPM WELLS	
	Construction (Casing, Hole, Grout, Etc.)	\$450,000
	Development (Disinfection, Testing, Etc.)	\$225,000
	Equipment (Pump/Motor, Pitless Adapter, Etc.)	\$225,000
	Raw Water Main (4,000')	\$300,000
2	WELL HOUSE AND TREATMENT BUILDING (129' X 28' & 32' X 26')	
	Structures (Building and Surge Tank)	\$1,114,320
	Equipment (Chemical Feed, Brine, Wet Well, and WW Pumps, Etc.)	\$116,000
	Miscellaneous Piping and Meters	\$130,000
3	TREATMENT EQUIPMENT	
	Cation Exchange Equipment (4 - 8' Diameter Units)	\$554,400
	Iron Removal Equipment (2 - 18' Diameter Units)	\$700,000
4	SALT STORAGE TANK	\$70,000
5	ELECTRICAL	
	Power Distribution	\$335,469
	Controls	\$335,469
	Emergency Generator	\$60,000
6	SCADA INTEGRATION	\$45,000
7	YARD PIPING AND SITE WORK	\$200,000
8	LANDSCAPING	\$60,000
	SUB-TOTAL	\$4,920,700
	CONTINGENCY (10%)	\$492,000
	TOTAL ESTIMATED COST OF CONSTRUCTION	\$5,412,700
	ENGINEERING (15%)	\$812,000
	SOIL AND MATERIAL TESTING	\$5,000
	TOTAL ESTIMATED COST OF PROJECT	\$6,229,700

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**COST ESTIMATE SUMMARY FOR ONE 1,000 GPM DEEP WELL,
TWO 500 GPM SHALLOW WELLS, AND
WELL HOUSE AND TREATMENT FACILITY**
Village of Sugar Grove, Kane County, Illinois

ITEM NO.	ITEM	AMOUNT
1	1,000 GPM DEEP WELL	
	Construction (Casing, Hole, Grout, Etc.)	\$530,000
	Development (Disinfection, Testing, Etc.)	\$100,000
	Equipment (Pump/Motor, Pitless Adapter, Etc.)	\$180,000
1	2 - 500 GPM SHALLOW WELLS	
	Construction (Casing, Hole, Grout, Etc.)	\$300,000
	Development (Disinfection, Testing, Etc.)	\$100,000
	Equipment (Pump/Motor, Pitless Adapter, Etc.)	\$150,000
	Raw Water Main (2,000')	\$150,000
2	WELL HOUSE AND TREATMENT BUILDING (94' X 33' & 32' X 26')	
	Structures (Building and Surge Tank)	\$951,520
	Equipment (Chemical Feed, Brine, Wet Well, and WW Pumps, Etc.)	\$133,000
	Miscellaneous Piping and Meters	\$150,000
3	TREATMENT EQUIPMENT	
	Cation Exchange Equipment (4 - 9' Diameter Units)	\$623,700
	Iron Removal Equipment (1 - 20.5' Diameter Unit)	\$263,000
4	SALT STORAGE TANK	\$80,000
5	ELECTRICAL	
	Power Distribution	\$318,034
	Controls	\$318,034
	Emergency Generator	\$375,000
6	SCADA INTEGRATION	\$75,000
7	YARD PIPING AND SITE WORK	\$205,000
8	LANDSCAPING	\$35,000
	SUB-TOTAL	\$5,037,300
	CONTINGENCY (10%)	\$504,000
	TOTAL ESTIMATED COST OF CONSTRUCTION	\$5,541,300
	ENGINEERING (15%)	\$831,000
	SOIL AND MATERIAL TESTING	\$5,000
	TOTAL ESTIMATED COST OF PROJECT	\$6,377,300

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**COST ESTIMATE SUMMARY FOR ONE 1,000 GPM DEEP WELL,
ONE 500 GPM SHALLOW WELL, AND
WELL HOUSE AND TREATMENT FACILITY**
Village of Sugar Grove, Kane County, Illinois

ITEM NO.	ITEM	AMOUNT
1	1,000 GPM DEEP WELL	
	Construction (Casing, Hole, Grout, Etc.)	\$530,000
	Development (Disinfection, Testing, Etc.)	\$100,000
	Equipment (Pump/Motor, Pitless Adapter, Etc.)	\$180,000
1	500 GPM SHALLOW WELL	
	Construction (Casing, Hole, Grout, Etc.)	\$150,000
	Development (Disinfection, Testing, Etc.)	\$50,000
	Equipment (Pump/Motor, Pitless Adapter, Etc.)	\$75,000
2	WELL HOUSE AND TREATMENT BUILDING (78' X 32' & 32' X 26')	
	Structures (Building and Surge Tank)	\$801,840
	Equipment (Chemical Feed, Brine, Wet Well, and WW Pumps, Etc.)	\$102,000
	Miscellaneous Piping and Meters	\$130,000
3	TREATMENT EQUIPMENT	
	Cation Exchange Equipment (4 - 8' Diameter Units)	\$554,400
	Iron Removal Equipment (1 - 14.5' Diameter Unit)	\$250,000
4	SALT STORAGE TANK	\$70,000
5	ELECTRICAL	
	Power Distribution	\$275,631
	Controls	\$275,631
	Emergency Generator	\$375,000
6	SCADA INTEGRATION	\$37,500
7	YARD PIPING AND SITE WORK	\$160,000
8	LANDSCAPING	\$25,000
	SUB-TOTAL	\$4,142,000
	CONTINGENCY (10%)	\$414,000
	TOTAL ESTIMATED COST OF CONSTRUCTION	\$4,556,000
	ENGINEERING (15%)	\$683,000
	SOIL AND MATERIAL TESTING	\$5,000
	TOTAL ESTIMATED COST OF PROJECT	\$5,244,000

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Appendix B: Water Works System Improvement Costs By Development

WATER WORKS SYSTEM IMPROVEMENTS PER DEVELOPMENT

WATER SYSTEM CONNECTION FEE ANALYSIS

Village of Sugar Grove, Kane County, Illinois

CONNECTION FEE SUMMARY (COST PER DEVELOPMENT BASED ON P.E.)

DEVELOPMENT	P.E.	MINIMUM	AVERAGE	MAXIMUM
Hannaford Farm	487	\$603,357	\$645,043	\$688,776
Settlers Ridge	9,933	\$12,319,118	\$13,156,498	\$14,063,179
Neumann Homes	7,377	\$9,149,153	\$9,771,015	\$10,444,431
Pulte	1,144	\$1,418,788	\$1,515,256	\$1,619,651
Stillwater	1,267	\$1,571,658	\$1,678,172	\$1,794,163
Kaneland Community School	625	\$775,125	\$827,828	\$884,862
TOTAL	20,833	\$25,837,199	\$27,593,812	\$29,495,063

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Legend:

	Staff Recommendation
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