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April 27, 2015

David Lothspeich
Village Manager
Village of Long Grove
3110 Old McHenry Road
Long Grove, IL 60047

Re: Downtown Water System
Preliminary Analysis & Findings
GHA Project No. 5000.006

Dear Mr. Lothspeich:

On behalf of the Village of Long Grove, Gewalt Hamilton Associates, Inc. (GHA) has conducted an analysis of the existing pump station, reservoir and distribution system for the water system currently serving the Sunset Foods development. After completing the initial assessment of the system we looked at what would be required to potentially serve the majority of the Long Grove downtown business district and surrounding homes/businesses. Our findings and potential options for the Village are outlined in this report.

Existing System Analysis

The assessment of the existing system began with reviewing the available information GHA received from ESI Consultants and the Village. We reviewed the design drawings, shop drawings, reports and contacted the water operator to become as familiar as possible with the existing system. The following is our best understanding of the existing parameters for the pump station, reservoir and distribution system that exists today.

Well Capacity

Two deep wells were constructed to provide a water source for the system. The wells were drilled into the Ironton-Galesville bedrock/aquifer. This aquifer is typical for deep well installations for municipal water systems. During the initial design of the system it was assumed the wells would each be able to produce a flow of 350 gallons per minute (gpm) for a total of 700 gpm. Since the wells have been installed production of the wells indicate they have been capable of providing an average a flow of approximately 400 gpm or a total of 800 gpm. This value is slightly higher than anticipated during the design of the water treatment facility.

The water pumped from the Ironton-Galesville aquifer is typically clean with few treatment requirements. Barium and radium are two items of note that are typically found in the water from this aquifer. Because of this, softeners, like the ones installed with the current system, are typically installed to remove a portion of the constituents to bring the water to within IEPA potable water requirements. Based on the information available to us it appears the wells were designed to operate separately and not conjunctively. This is typical for water systems to provide an alternative source of water in the event one of the wells becomes inoperable. In emergency situations the water system has the capability of running both wells at the same time bypassing the softeners. Running both wells will cause the system to exceed the IEPA constituent requirements for barium and radium limits for a short period of time as both wells are operating. For the purposes of this report it was assumed that only one well would operate at a time.

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Pump Station/Treatment System

Along with the reservoir a pumping and treatment system was installed to treat and distribute the well water to the system users. The treatment system mainly comprises of a chlorine injection station and a series of softeners. All of the treatment is done prior to the water entering the reservoir.

Based on the shop drawings and submittals two softeners were installed with a combined capacity of 350 gpm from the wells. The flow was designed to split into a treated flow rate of 210 gpm and a bypassed flow rate of 140 gpm. This amounts to roughly a 40% bypass flow rate. The blend valve to mix the treated water with the bypass water is set by the water operator, Mr. Murney Swanson of Swanson Water Treatment. In 2013 the percent bypass flow varied from 0 to 46 percent. The average flow from the wells was 403 gpm with an average bypass flow of 33 percent.

Based on this information it appears the softeners are treating more water than initially designed. According to current test results the water is exceeding the IEPA requirements for potable water. We recommend continuing the current testing that Swanson Water Treatment, Inc. is conducting to verify the IEPA standards are being met. If in the future it is determined that these requirements are not being met, modifications to the pump lines will be needed to reduce the flow from the wells or an additional softener will need to be added to increase capacity. Reduction of flow from the wells could be done simply by partially closing the butterfly valves for the well pumps; this would have to be verified at a later date.

Following treatment and storage the water is pumped from the reservoir into the distribution system for domestic water usage and fire flow demands. The station was installed with a series of 3 pumps and a hydropneumatic tank. The three pumps are a 100 gpm @ 192' total dynamic head, 200 gpm @ 192' total dynamic head and a 1500 gpm @ 142' total dynamic head. The system was designed so the pumps would not need to be constantly running. The hydropneumatic tank was installed to provide static pressure and limited storage for the system. The pumps would kick on to pressurize the hydropneumatic tank and shut off for a period of time as the pressure falls in the system. The following table shows the current settings for when the pumps kick on and off.

Pump	On	Off
100 gpm	55 psi	68 psi
200 gpm	53 psi	67 psi
1500 gpm	52 psi	76 psi

The 100 gpm and 200 gpm pumps are designed to provide the average day, maximum day and peak hour demands for the existing system. The 1500 gpm pump would only kick on during a fire flow scenario or during hydrant flushing operations. Although the pumps are rated at a combined 1800 gpm they can provide additional flow above their "rated" flow rates. As the flow increases past the rated flow the dynamic head (pressure provided by the pump at a given flow) begins to significantly reduce. The maximum flow of the pumps is typically determined by modelling the system. The calculated existing maximum flow available from the pumps is discussed in the existing system modelling section later in this report.

Distribution

The distribution system currently is comprised of a series of 12" transmission mains and 8" distribution mains. There are no 6" distribution mains except for water services and hydrant leads. The system has an 8" loop around the existing Sunset Foods building that serves the properties immediately adjacent with both domestic flows and fire flows. There are currently two lines stubbed out for future connection. The first is a 12" line that runs directly west of the existing pump station and ends on the southwest corner of Robert Parker Coffin Road and IL Route 83. There is also an 8" line that was installed on the east side of IL Route 83 that runs south until crossing 83 on the north side of IL Route 53. See Exhibit B for a map that includes the existing system.

Looking through the reports and system model prepared by ESI the 8" line on the east side of IL Route 83 was initially designed as a 12" line. This was likely proposed to provide a 12" loop through the downtown and reduce friction loss in the system during high flow events such as fire flows. We could not find any documentation of why this line was reduced from a 12" to an 8" line. The installation of this smaller diameter pipe will increase the friction through the pipe resulting in lower available fire flows in the system west of Illinois Route 83.

Storage

The existing storage for the system is an at grade cast in place concrete reservoir. The reservoir was installed with baffles and consists of two chambers to promote water flow through the storage tank. Due to the low demand of the current system, water movement through the reservoir is a key component of the design. This prevents water stagnation that could lead to water quality issues and customer complaints. Based on the design drawings the reservoir holds 132,956 gallons at the overflow elevation. The reservoir level is 8.4 feet from the intake point to the overflow elevation. Currently the wells are set to turn on when the water level is below 6 feet and off when the reservoir reaches 8 feet.

Since the existing user base is mainly commercial we do not anticipate the system would receive complaints due to poor water quality. As residential uses are added to the system this will be more of a concern and will have to be monitored.

Existing System Demand

Pump station flow data from 2013 has indicated that the average daily flow is approximately 13,500 gallons or 9.4 gpm. Due to this low demand the wells and treatment plant only operates a few hours every two or three days. In addition to the normal daily flows, fire flow data was analyzed. Currently the Long Grove Fire Department has data that indicates the system can provide fire flows near 3000 gpm around the Sunset Foods development. Based on the fire flow data that we analyzed and the available pumping capacity at the pump station we do not believe this is a true assessment of the system. Refer to the existing system modelling section of the report for an analysis on the available fire flows for the existing system.

GHA has not performed flow tests at this time due to weather concerns. We anticipate now that spring has arrived flow tests will be conducted in May to verify and further calibrate the model.

Existing System Modelling

Once all the existing system information was obtained a WaterGems model was put together for the existing pump station and distribution system. The pump station was inserted into the model utilizing record drawings and available pump curves our office received from ESI.

After insertion of the pumping station into the model, we began looking at the existing available fire flows from the system. Although the model indicates that the pumps would be capable of providing close to 3000 gpm at an IEPA minimum pressure of 20 psi in the system, this flow would be detrimental to the pump station. When pumps begin to operate past their recommended maximum flow, cavitation and the potential for a vacuum in the suction line may develop. Cavitation in pumps is highly undesirable as permanent damage to the impellers is caused that reduces the performance of the pump and ultimately will require it to be replaced earlier than expected.

Because of the above concerns we believe during a fire the maximum flow that should be drawn from the system would be approximately 2100 gpm. This flow is approximately equivalent to opening two 2.5" ports on two different hydrants or one 4.5" port on a single fire hydrant.

Proposed Service Area

The Village has indicated to our office a service area they were anticipating this system would ultimately serve. At this time the analyses included in this report do not account for future extensions of the water distribution system except for the ones noted in this report. If future extension beyond the proposed service area is a potential possibility an ultimate service area would need to be developed to determine if any additional improvements need to be made to the system.

Exhibit A shows the service area that was analyzed as part of this report. The service area was broken out into various usage areas. These usage areas are also broken out in the demand calculations as shown in Appendix A. Since no water usage data is available for the extension areas, daily flows were estimated from Lake County Public Works Resident Equivalent (RE) values. The County uses these RE values to assess fees for sanitary sewer usage. Since these properties are currently on un-metered wells we believe this is the best way to accurately estimate the proposed water usage. In addition to the current RE values of the properties, estimates were made for parcels that have potential future expansion or developments. These values were either pulled from various reports we received from ESI or were estimated based on potential building square footage and use.

The demands for a water system are typically broken out into three categories for analysis purposes, the average day, the maximum day and the peak hour. The average daily demand is the demand the system will see on an average day of operation. The maximum day demand is the maximum domestic usage the system will experience during a 1 year period over the course of one 24 hour period. The peak hour is the maximum domestic usage the system will experience in one hour.

The maximum day demand typically ranges from 1.5-2 times the average day and typically happens during the summer when people are irrigating. The peak hour demand is typically 1.5-2 times the maximum day demand. The peak hour demand is typically the peak hour of the system during a maximum day. When analyzing potential extensions to water systems these values are determined from water usage reports from meters or wells. Since this data is not available for this system and an estimated RE value is being used for water usage, we have assumed a factor of 1.75 for the maximum day and due to the large amount of potential irrigation use for the system a factor of 2 was used for the peak hour. These values will likely be conservative compared to the actual final build out demand the system will experience. We feel the values are a good representation of a worst case scenario the system will experience and follow industry standards for water system design in the Chicagoland area.

Existing Private Wells

As the Village allows future connections to the proposed distribution system there a couple of standards & requirements the Village will need to require when allowing connection to the system. Besides the required tap fees, the Village will need to assess whether the property owners will be able to keep their existing well or if it must be abandoned as part of their connection to the system. This will need to be discussed as the project moves further along.

Proposed Distribution System

After inputting the demands into the system, a skeletal system representing the future distribution lines was inserted into the model. The distribution system includes a 12" backbone distribution main on Old McHenry Road and Robert Parker Coffin Road with 8" distribution mains within the subdivisions.

Appendix B shows the pressures throughout the system during a maximum day demand. Typically these pressures in most municipal systems vary greatly throughout town. Since this is such a small usage area the pressures will not vary much from the system static pressures. IEPA requires that all systems maintain a minimum pressure of 35psi during the max day demand. As seen in the exhibit the lowest pressure during a max day is 62.4psi which is well above the minimum. This is an indicator that the driving design factor of this system is the fire flow recommendations and not the domestic daily demands.

Proposed Fire Flows

With the system demands and piping input into the model we began to look at proposed fire flows in multiple locations of the system. Fire times and flows were calculated based on the Insurance Services Office (ISO) method for various properties within the service area. The ISO values were calculated for the proposed senior housing development on the corner of Route 83 and Route 53, Kildeer Countryside Elementary School, various buildings in the downtown district and for a single family residence. The table below shows the calculated recommended fire flow values and fire durations.

Fire Location	Fire Flow in Gallons Per Minute	Length of Fire in Hours	Total in Gallons
Senior Housing Development	3500 gpm	3 Hours	630,000
Kildeer Countryside Elementary School	3000 gpm	3 Hours	540,000
Downtown Business District	2500 gpm	2 Hours	300,000
Single Family Home	1000 gpm	1 Hour	60,000

In addition to recommending fire flow amounts and durations the ISO develops ratings for fire departments that effect insurance costs for property owners. If the recommended fire flows cannot be received from the system the ISO lowers the rating of the fire protection district affecting the insurance rates for the area. At this time we do not know the insurance benefits of providing adequate fire protection per ISO guidelines. Since the proposed service area currently does not have any fire hydrant access any improvements installed would benefit the fire department but may not reduce current insurance rates.

Proposed Storage Requirements

The Great Lakes Upper Mississippi River Board has developed the Ten States Standards for recommended standards for water works in the great lakes region. This document is typically used for the design and operation of water works systems in our area. Part seven of this document recommends storage should be provided for the average day demand of the system plus the required fire flow for the most stringent use. In addition to these requirements the standards also state that excessive storage capacity should be avoided to prevent water quality deterioration problems.

The existing pump station has a reservoir with a total storage of 132,965 gallons. We recommend that any additional storage would be provided in a standpipe/water tower. The following table shows the additional storage recommendations for various fire flows according to the ten state standards and ISO recommendations.

Fire Flow Event	Total Required Additional Storage
Senior Housing Development	689,544 Gallons
Kildeer Countryside Middle School	599,544 Gallons
Downtown Business District	359,544 Gallons
Single Family Home	119,544 Gallons

Due to the low usage of the system we do not recommend providing the ultimate storage capacity for the senior housing development. Providing this amount of storage would create operational issues concerning water quality. Addition provisions would have to be installed to verify the water is “turned over” frequently to prevent water quality issues. If the Village is interested in providing additional storage we would recommend installing an additional 200,000 gallons in an elevated storage tank.

Below is a table that indicates the length of fire flow in minutes that can be received from the system subtracting the average day from the available storage and assuming well production during the fire flow.

	Existing Reservoir	Addition of Elevated Tank	Recommended Length
Senior Housing Development	7.5 Minutes	72 Minutes	180 Minutes
Kildeer Countryside Middle School	9 Minutes	86 Minutes	180 Minutes
Downtown Business District	11 Minutes	106 Minutes	120 Minutes
Single Family Home	20 Minutes	200 Minutes	60 Minutes

The above values indicate the available storage per the ten state standards for fire flow. In actuality, the wells will be able to provide the average day flows after the fire. If the average day storage was removed from the storage requirement the length of time that would be available to provide the fire flow would increase. Assuming the reservoir was at the minimum level before the well pump turns on at 6' (approximately 70% full) when the fire flow began, the available fire flow lengths would be increased by the following amounts starting with the senior housing development; 23 minutes, 27.5 minutes, 34 minutes and 66 minutes.

The elevated tank would replace the existing hydropneumatic tank and help regulate pressures throughout the system. During fire flows the elevated storage will also give the system time to react and adjust to the highly variable flows that exit the system during fire flows. The elevated storage gives the pump station time to react and adjust pump settings as necessary to aid in providing a constant pressure and prevent sudden pressure changes in the system that can cause damage to the distribution lines. The elevated tank will also provide a minimal amount of flow during fire flows for a period of time as the tank is drained.

Pump Station Improvements

In conjunction with the additional storage requirements the current pumps will not be able to deliver the recommended fire flows to the system except for the domestic demand and a single family home fire. In addition to the low pumping capacity pump stations are typically designed to assume the largest pump is out of service. Because of these requirements at a minimum we recommend installing an additional 1500 gpm pump as a backup in the event that the existing 1500 gpm pump is out of service.

Ideally this additional 1500 gpm would be put in service in conjunction with the existing 1500 gpm pump to increase the available fire flows throughout the system. The model indicates that if these pumps run together the system would be capable of providing the maximum fire flow recommendation of 3500 gpm with other various improvements. After review of the electrical requirements, the pumps would be able to operate together from the existing electrical service except the emergency generator would not be able to power the system in the event of a power outage. Because of this we do not recommend operating these pumps together unless the emergency power capacity was increased. If no emergency power improvements are performed the additional 1500 gpm pump

would serve solely as a redundancy to the largest pump in the pump station if any maintenance would have to occur.

Northwest Water Commission Connection

The most current report from AECOM discussing the Northwest Water Commission (NWWC) connection states that without transmission main improvements 191,081 gallons per day can be supplied to the existing Long Grove pump station. This daily flow amounts to roughly 132 gpm compared to the 400 gpm the wells are currently providing. This water source would be accepted by the pump station very similarly to the current well source except that the water would not have to be softened. The water plant would still have to re-inject chlorine and the booster pumps will still have to operate to maintain pressure in the Long Grove system.

Because of this all the improvements to the pump station and distribution system that are required for the various improvements utilizing the wells would also be required if the NWWC connection was utilized. The only benefit to the NWWC connection is that the Village would be on a Lake Michigan water source and they would not have to operate the deep wells and softeners for their water source.

If the NWWC source was decided to be used we would recommend the Village keep the softeners and the deep wells on an emergency basis. NWWC may try to push to have them abandoned but there are many villages in the area that have deep wells as an emergency backup system if their Lake Michigan source was to be interrupted for a long period of time.

If the Village was to purchase water from the NWWC an estimated fee of $1.78 per 1000 gallons would be assessed. Currently the well pumps cost the Village $0.60 per 1000 gallons (assuming an electricity cost of 7.5 cents per KWH). We could not locate the pump information for the existing wells but have contacted pump companies and estimated the horsepower of the well pumps to be 200 horsepower for the purpose of this calculation. The maintenance cost of the softeners was assumed to be approximately 15 cents per 1000 gallons. The maintenance of the wells was not included in this estimate. No analysis was done on the cost to operate the pump station. In either case the Village will need to operate the pump station if a NWWC source was utilized.

AECOM provided the NWWC a draft letter discussing the proposed connection to their water system and included an estimated cost in 2013 construction dollars of $600,000 for a transmission main from the Long Grove pump station/reservoir to the nearest connection point to the NWWC system. We recommend increasing this value to $700,000 for the evaluation of this connection due to rising construction costs in the past few years.

Potential Improvement Options

With all the above information noted we have broken the potential improvements into various categories for budgeting/presentation purposes to the Village Board. The first option would provide domestic demand to the entire service area and the potential for ultimately providing fire flows. The second and third options add various improvements to increase available fire flows and providing additional storage.

Option 1 – Distribution System

The first option includes a 12" distribution main along Robert Parker Coffin Road and Old McHenry Road. The 12" backbone would allow for reasonable future extensions as shown on the service map and give the system the capability to provide the recommended fire flows per ISO requirements. This option does not include any pump or storage improvements. Residential fire flows would be able to be provided throughout the system with no pump upgrades. The available fire flows in the existing system would be marginally reduced by approximately 150 gpm due to the added demand of the system. Appendix B shows the available fire flow capacity at the senior housing center maintaining a minimum pressure of 20psi in the system.

Option 2 – Pump Upgrades

Option 2 includes the basic distribution system as outlined in option 1 and includes various pump upgrades at the pump station. This option includes the installation of an additional 1500 gpm pump and the required electrical improvements to operate the pumps together. This would require some moderate re-wiring within the pump station and replacement/installation of a new emergency generator. The addition of this pump would provide the recommended fire flows throughout the entire system except for at the senior housing facility. The senior housing facility would be able to receive 3300 gpm, roughly 200 gpm lower than the recommended fire flow of 3500 gpm. The available fire flow can be seen in Appendix C.

Option 3 – Elevated Storage

The final option includes the distribution improvements noted in option 1 and the ultimate pump upgrades with emergency power outlined in option 2. In addition to these improvements an elevated storage tank with a 200,000 gallon capacity would be installed. Although this would only bring the total storage for the system to 332,956 gallons it would provide more than enough capacity for a residential fire and provide 90% of the required storage for a fire in the downtown area.

The elevated storage tank would be of the pedesphere/spheroidal design similar to many municipal elevated storage tanks in the Chicagoland area. The tank would be approximately 170' tall and be 41' in diameter at the widest point.

The elevated storage would add stability to the system reducing the potential for large pressure changes in the system when the larger pumps turn on and off. In addition to regulating the pressure a small amount of flow will be added to the fire flows of the system. In particular the senior housing center fire flow of 3500 gpm should be achievable for a short duration during the early stages of the fire. We have not modelled this scenario at this time

because it will require some extensive input to the model to determine how the system will operate during a max day with a fire at the senior housing center. If providing elevated storage and the full 3500 gpm fire flow for the senior housing center is something the Village is interested in exploring we can pursue modelling this scenario.

The storage for the senior housing center would be insufficient by about 535,000 gallons. Providing this amount of additional storage is not practical for a system of this size with such low domestic demands. With the system improvements, a 3500 gpm fire flow would be able to be sustained for a period of 72 minutes. This would assume the elevated storage and reservoir are emptied.

In addition to the additional fire storage capacity the elevated storage will help regulate the pressures in the system as demands change. This will aid in maintaining pressures during peak hour flows during the summer with all of the potential irrigation use.

Cost Summarization

With the above noted, Exhibit C summarizes the various cost options available for further investigation. The costs depicted are high level estimates that have been developed based on conceptual design. Below is a list of the assumptions that were made for development of these costs.

- The distribution improvements includes the cost for domestic water service lines to the right of way line and assumes the property owner will make the required connection at that point and cover all work on private property.
- Building fire service connections to the distribution mains were not considered.
- LCDOT will allow the installation of the 12” water main within their right of way via open cut methods in the pavement and direction drill/open cut in the parkway.
- There is sufficient room in the pump station adjacent to the existing pumps to install an additional 1500 gpm pump.
- No property acquisition is required for the proposed improvements.

To summarize the benefits of each option the below table discusses the various options listed above and shown in Exhibit C. A check indicates that that option provides the various depicted requirement or recommendation. Generally, the IEPA has various requirements while the ISO and ten state standards are recommendations that are typically followed during design of water works systems. Items listed in italics are system requirements that must be followed.

	Option 1 $1,440,000	Option 2 $1,790,000	Option 3 $3,240,000
Domestic Max Day Demand Greater Than 35psi	X	X	X
Indicated Fire Flow With System Pressure Greater Than 20psi	X	X	X
Residential Fire Flow, 1500 gpm	X	X	X
Downtown Fire Flow, 2500 gpm		X	X
School Fire Flow, 3000 gpm		X	X
Senior Housing Center Fire Flow, 3500 gpm			X*
Largest Pump Redundancy			
Average Day Storage	X	X	X
Residential Fire Flow Storage			X
Downtown Fire Flow Storage			
School Fire Flow Storage			
Senior Housing Center Fire Flow Storage			

*This scenario has not been modelled at this time but we believe this flow will be achievable for a duration until the elevated storage tank is emptied.

Depending on the goals the Village has for this system the above options could be further broken down and refined. The options when modifying the pump station and adding storage are nearly endless. If the Village has additional goals or would like us to evaluate one of these options further we can provide additional recommendations and updated costs.

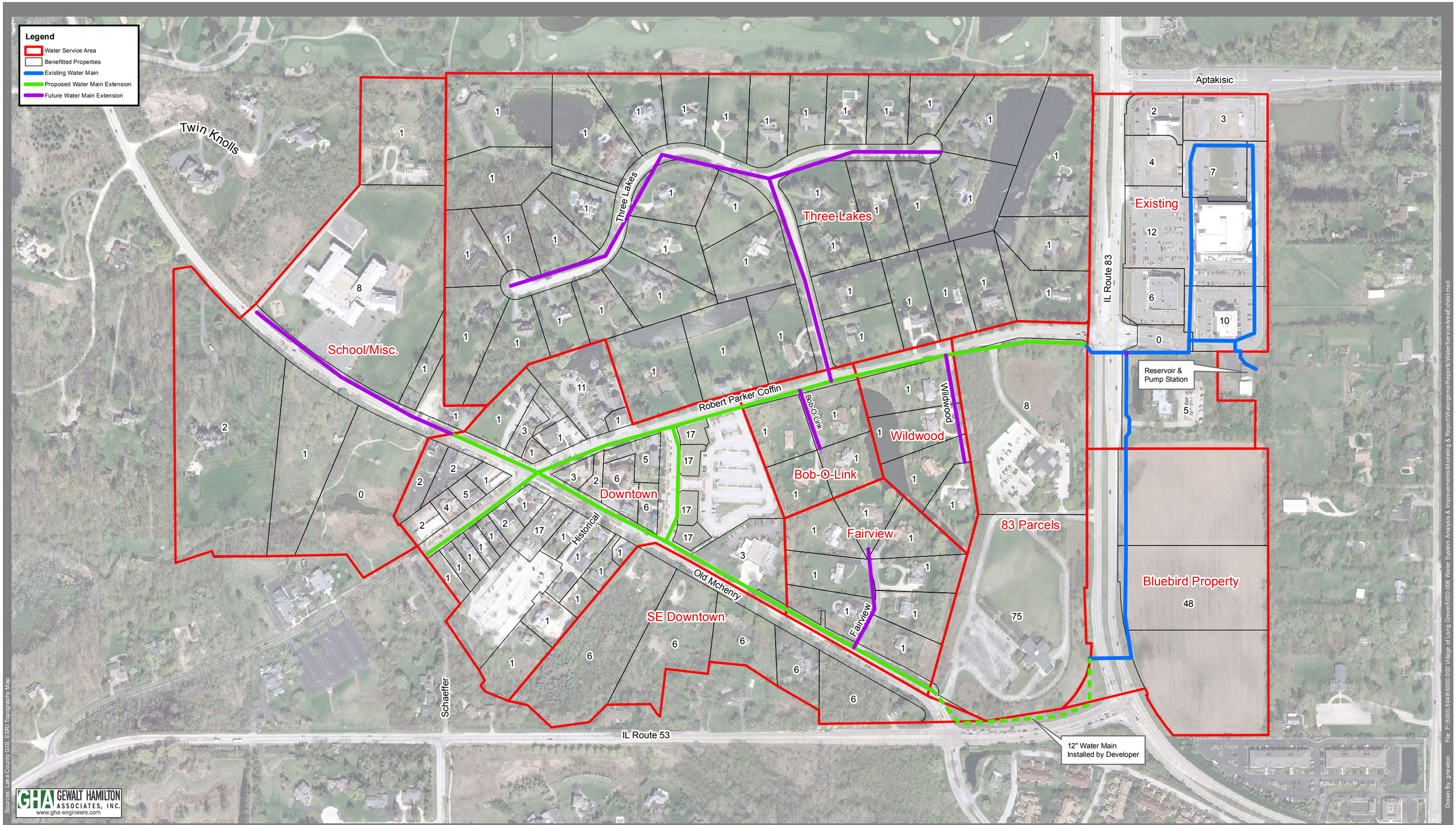
We appreciate the opportunity to work with the Village on this project and if there is anything else the Village needs from our office please do not hesitate to contact us.

Sincerely,
Gewalt Hamilton Associates, Inc.

Michael J. Shrake

Michael Shrake, P.E.
Village Engineer

Brian Wesolowski, P.E.
Professional Engineer



N

1 inch = 350 Feet

Exhibit A

Water Service Areas
Long Grove, IL

Map Center: -87.99526 42.17894

Date: 4/28/2015 Project: 5000.006

N

1 inch = 350 Feet

Exhibit B

Proposed Water Main Extension
Long Grove, IL

Map Center: -87.99577 42.17892

Date: 4/27/2015 Project: 5000.006

Exhibit C - Water System Extension Analysis

Village of Long Grove, Illinois

5000.006

April 27, 2015

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CONCEPTUAL ENGINEER'S OPINION OF PROBABLE COST

Estimate Based on Spring 2015 Construction Costs

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
	Option 1 - Base Distribution System				
1.	12" Distribution System	5,460	FOOT	$250.00	$1,365,000.00
2.	Harbor Chase Credit	1	L SUM	-$250,000.00	($250,000.00)
				Construction Total:	**$1,115,000.00**
				Engineering (7%):	**$78,050.00**
				Construction Management (10%):	**$111,500.00**
				Subtotal:	**$1,304,550.00**
				Contingency (10%):	**$130,455.00**
				Total (Rounded):	**$1,440,000.00**
	Option 2 - New 1500gpm Pump & Emergency Power Improvements				
1.	12" Distribution System	5,460	FOOT	$250.00	$1,365,000.00
2.	Harbor Chase Credit	1	L SUM	-$250,000.00	($250,000.00)
3.	New 1500gpm Pump	1	L SUM	$40,000.00	$40,000.00
4.	Pump Station Piping/Valve Improvements	1	L SUM	$45,000.00	$45,000.00
5.	Pump Station Electrical Improvements	1	L SUM	$35,000.00	$35,000.00
6.	New 175KW Emergency Generator	1	L SUM	$120,000.00	$120,000.00
				Construction Total:	**$1,355,000.00**
				Engineering (10%):	**$135,500.00**
				Construction Management (10%):	**$135,500.00**
				Subtotal:	**$1,626,000.00**
				Contingency (10%):	**$162,600.00**
				Total (Rounded):	**$1,790,000.00**
	Option 3 - Elevated Storage Installation				
1.	12" Distribution System	5,460	FOOT	$250.00	$1,365,000.00
2.	Harbor Chase Credit	1	L SUM	-$250,000.00	($250,000.00)
3.	New 1500gpm Pump	1	L SUM	$40,000.00	$40,000.00
4.	Pump Station Piping/Valve Improvements	1	L SUM	$45,000.00	$45,000.00
5.	Pump Station Electrical Improvements	1	L SUM	$35,000.00	$35,000.00
6.	New 175KW Emergency Generator	1	L SUM	$120,000.00	$120,000.00
7.	160' Tall 200,000 Gallon Elevated Storage Tank	1	L SUM	$900,000.00	$900,000.00
8.	Site Improvements Adjacent to Water Tower	1	L SUM	$250,000.00	$250,000.00
9.	Pump Station Electrical Improvements/Control Modifications	1	L SUM	$5,000.00	$5,000.00
				Construction Total:	**$2,510,000.00**
				Engineering (7%):	**$175,700.00**
				Construction Management (10%):	**$251,000.00**
				Subtotal:	**$2,936,700.00**
				Contingency (10%):	**$293,670.00**
				Total (Rounded):	**$3,240,000.00**

*Since Gewalt-Hamilton Associates Inc. Has No Control Over the Cost of Labor, Materials, or Equipment, or Over the Contractor's Methods of Determining Prices, or Over Competitive Bidding of Market Conditions, Opinions of Probable Costs, as Provided for Herein, Are to be Made on the Basis of Experience and Qualifications and Represent the Best Judgement as a Design Professional Familiar with the Construction Industry. Gewalt-Hamilton Associates, Inc., Cannot and Does Not Guarantee That Proposals, Bids, or The Construction Costs Will Not Vary From Opinions of Probable Cost Prepared for the Owner.

Appendix A - Proposed Water Usage

Water Usage		Ave Day		Max Day	1.75	Peak Hour	2
Sub Area	RE	GPM	GPD	GPM	GPD	GPM	
Existing	49	8.51	12,250	14.89	21,438	29.77	
Three Lakes Sub	41	7.12	10,250	12.46	17,938	24.91	
Bob-O-Link Sub	4	0.69	1,000	1.22	1,750	2.43	
Wildwood Sub	4	0.69	1,000	1.22	1,750	2.43	
Fairview Sub	8	1.39	2,000	2.43	3,500	4.86	
Downtown Business Area	159	27.60	39,750	48.31	69,563	96.61	
83 Parcels	83	14.41	20,750	25.22	36,313	50.43	
School/Misc.	14	2.43	3,500	4.25	6,125	8.51	
Bluebird Property	48	8.33	12,000	14.58	21,000	29.17	
SE Downtown	30	5.21	7,500	9.11	13,125	18.23	
Total:	440	76.39	110,000	133.68	192,500	267.36	

Well Production Capacity (GPM)	
Well #1	400
Well #2	400

	GPM	GPD	Cost Per 1000 Gal	Yearly Cost (Based on Ave Day)
Treatment Capacity	400	576,000	$0.60	$24,090.00
NWWC Capacity	132	190,080	$1.78	$71,467.00

Required Fire Flow	Hours	GPM	Total in Gallons
Fire Flow for Senior Housing	3	3500	630,000
Fire Flow for School	3	3000	540,000
Fire Flow for Downtown	2	2500	300,000
Fire Flow for Residential	1	1000	60,000

Required Total Storage	Fire + 1 Ave Day + No Well Production
Storage Required for Senior Housing	740,000
Storage Required for School Fire	650,000
Storage Required for Downtown	410,000
Storage Required for Residential	170,000

Existing Storage	132,956

Required Additional Storage	Fire + 1 Ave Day + No Well Production
Storage Required for Senior Housing	607,044
Storage Required for School Fire	517,044
Storage Required for Downtown	277,044
Storage Required for Residential	37,044

Required Additional Storage	Fire + 1 Ave Day + Fire Duration Well Production
Storage Required for Senior Housing	535,044
Storage Required for School Fire	445,044
Storage Required for Downtown	229,044
Storage Required for Residential	13,044

N

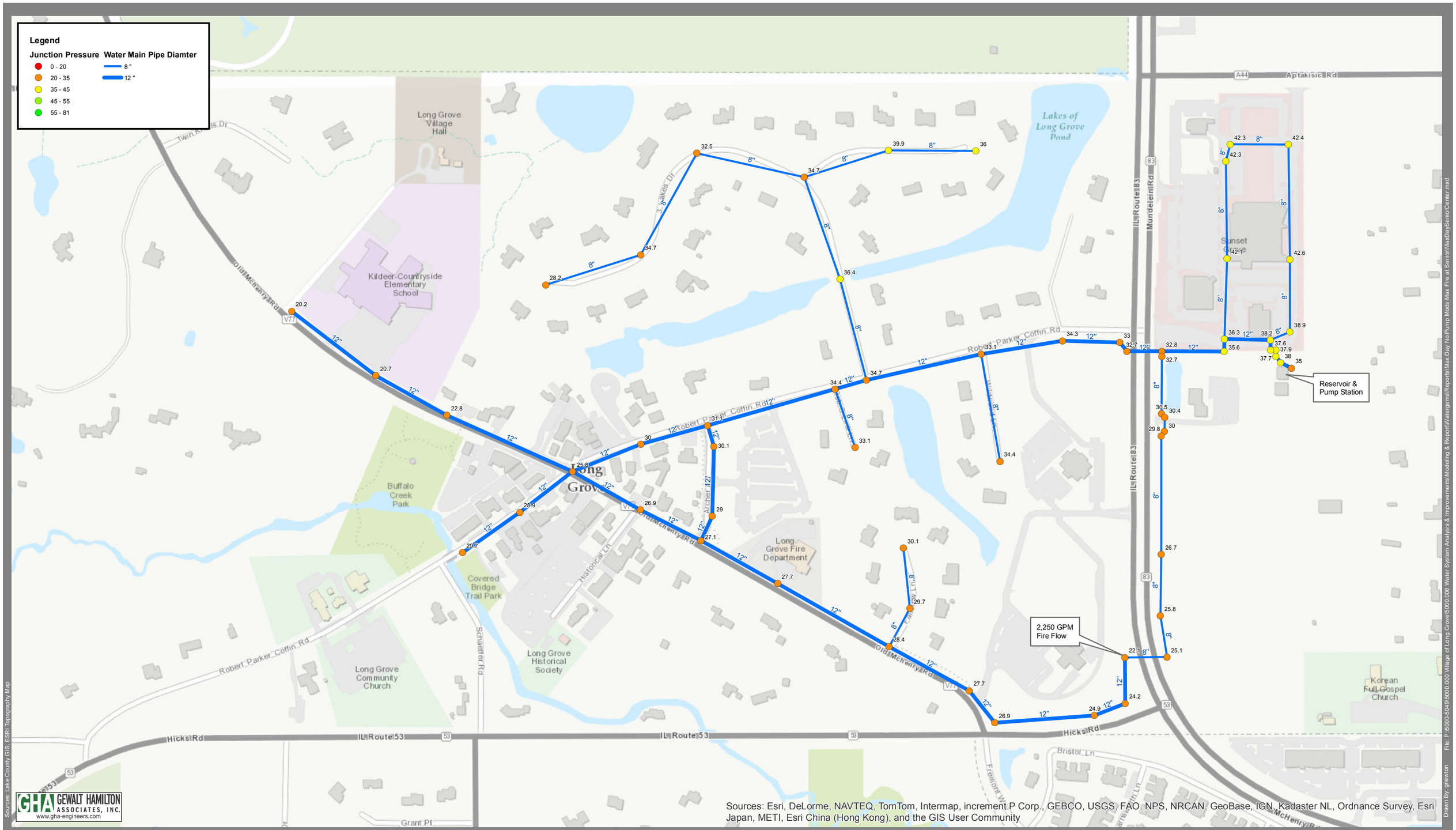
1 inch = 350 Feet

Appendix B

Max Day Demand Pressures
Long Grove, IL

Map Center: -87.99577 42.17892

Date: 4/27/2015 Project: 5000.006



N

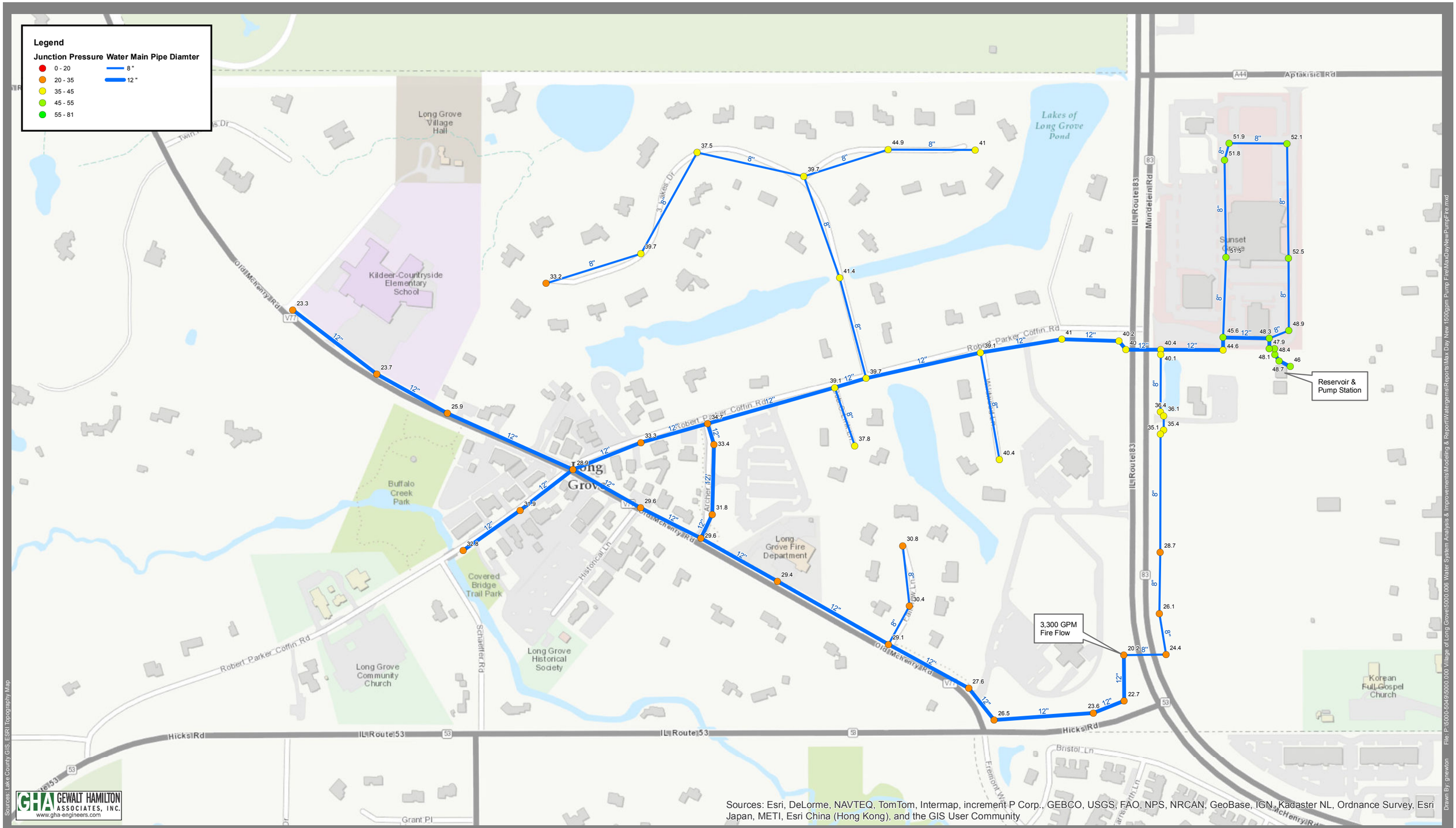
1 inch = 350 Feet

Appendix C

Available Fire Flow with No Pump Improvements
Long Grove, IL

Map Center: -87.99577 42.17892

Date: 4/27/2015 Project: 5000.006



N

1 inch = 350 Feet

Appendix D

Available Fire Flow with Additional 1,500 GPM Pump
Long Grove, IL

Map Center: -87.99577 42.17892

Date: 4/27/2015 Project: 5000.006