

VILLAGE OF LIBERTYVILLE
BOARD OF TRUSTEES
WATER & SEWER COMMITTEE

Tuesday, October 11, 2016
7:00 pm
Village Hall

Agenda

1. Call to Order at 7:00 pm
2. Minutes of September 13, 2016 Meeting
3. Water & Sewer Capital Improvement Projects Updates:
 - a. 911 & 915 W. Park Avenue Watermain Easements
 - b. 2016 Underground Utility Improvements Program
 - c. 2017 Underground Utility Improvements Program
 - d. North Shore Bikepath/Sunnyside Avenue Drainage Improvements
4. Water & Sewer Bill Appeal:
 - a. 617 Hampton Terrace
5. Proposed Financial Incentive Program to Encourage Residential Lead Service Line Replacements
6. Phosphorus Removal Feasibility Study at Wastewater Treatment Plant
7. Other

VILLAGE OF LIBERTYVILLE
BOARD OF TRUSTEES
WATER & SEWER COMMITTEE

Tuesday, September 13, 2016

7:00 pm

Village Hall

Minutes

Attendance

Committee: Trustee Scott Adams, Trustee Donna Johnson, Trustee Rich Moras

Village Board: Mayor Terry Weppeler, Trustee Pete Garrity

Staff: Village Administrator Kevin Bowens, Director of Public Works Paul Kendzior, Assistant to the Director Laura Ditanto, Finance Director Patrice Sutton, Police Chief Clint Herdegen, Fire Chief Rich Carani

Others: Pat Carey

Agenda

1. Call to Order at 7:00 pm

2. Minutes of August 9, 2016 Meeting

The minutes were approved as written.

3. Water & Sewer Capital Improvement Projects Updates

a) 911 & 915 W. Park Avenue Watermain Easements

The Easement Agreements have been finalized and delivered to the property owners (Mr. and Mrs. Strampel), who have not executed them as of this date. The Village Attorney is pursuing eminent domain proceedings for the Village to gain the easement.

b) 2016 Underground Utility Improvements Program

The contractor, Trine Construction Corp. has completed the watermain replacement work, including service installations on Johnson Avenue, Merrill Court, Wheeler Court, West Ellis Avenue, East Ellis Avenue and Fourth Avenue at Paddock Lane.

c) 2017 Underground Utility Improvements Program

Our consultant, Gewalt-Hamilton continues the water main design plans and water main routing concept. The locations for the proposed water main replacement work include Route 45 (just south of Peterson Road), Cleveland Ave., Arbor Ct. and Lange Ct.

4. Repair of Sanitary Service at 814 Valley Park Drive

Last winter Intren (ComEd's subcontractor) mistakenly directionally bored through the sanitary service for the home at 814 Valley Park Drive. Intren made the repair (which was located in the parkway) and then televised the line. The televising indicated an existing poorly made repair about two-feet away from the Village's main line, which is located in the center of the street. This defective repair turned out to be a three-inch plastic piece of pipe that was inserted internally. This smaller piece of pipe resulted in a one-inch lip around the entire circumference of the service and was definitely a concern to cause future blockages.

The homeowner, Tom Tunncliff, was initially adamant that this was the Village's responsibility. The Municipal Code is clear that the sanitary service is the property owner's responsibility up to

the main, including the wye connection. The Village had not completed any utility (sanitary sewer, water main or storm sewer) work within the right-of-way fronting the Tunnickliff's property. The house was constructed in the early 1960's and has been occupied by his parents since 1977. Tom and his wife have lived in the home for the past couple years. Tunnickliff was adamant that neither he nor his parents had ever undertaken repair work on the service line. Staff could not find any evidence that the Village had undertaken any kind of work that would have damaged the sanitary service. The street was reconstructed in 2013, but included no utility work. We did however find evidence of a Plumbing Permit to install a clean-out in 2005. It is highly probable that this internal liner work was completed as part of this.

The Village retained Arrow Plumbing, which was the lowest of three quotes, to remove the three-inch liner and replace with a four-inch piece of PVC pipe with mission bands and couplings. During the course of the repair, it was determined that the internal liner was in fact installed by a private plumber. Tunnickliff agreed to pay for the work in full, in which amounted to \$5,015.00.

Since the repair was located within the roadway, Staff is recommending that Tunnickliff be reimbursed for the flowable-fill (low-strength concrete) that was used for backfill. This itemized cost is \$1,200.00. The Village has previously paid this expense for past similar instances. The Committee concurred 3-0 for Tunnickliff to be reimbursed the \$1,200 for the flowable fill expense.

5. Water & Sewer Bill Appeals

618 Ames Street and 15192 W. Rockland Road

At last month's meeting, the Committee discussed high water & sewer bill appeals from three properties (15192 W. Rockland Road, 618 Ames Street and 617 Hampton Terrace). Following a discussion and verification that no obvious leaks were found, the Committee decided to test the accuracy of each of the water meters and waive the standard testing fee (\$50.00). Staff was able to coordinate the testing of two of the meters (15192 W. Rockland Road and 618 Ames Street). Both meters tested within specifications and are accurate.

- The amount in dispute for 15192 W. Rockland Road is \$841.86.
- The former homeowner of 618 Ames Street is requesting a reduction from \$857.73 to \$73.17.

Staff is recommending that the Committee deny the appeals for the two properties and the customers pay off their bill at the wholesale rate the Village pays to CLCJAWA (\$2.67 per 1,000 gallons) over a 12-month payment period. The Committee concurred with the Staff recommendation 3-0.

617 Hampton Terrace

The decision on the appeal for 617 Hampton Terrace will be deferred until arrangements can be made to test the meter accuracy. Staff has left numerous messages with the current residents and have not yet received a return call to date. Staff is now in the process of trying to contact the former resident who is actually the party appealing the high bill.

6. Possible Financial Incentive Program to Encourage Residential Lead Service Line Replacements

Staff met to propose a suitable financial incentive program to encourage the replacement of residential lead service lines in the Village. It is estimated that there are approximately 375 lead services still within the Village's right-of-way (between the main and B-Box) and approximately 750 lead services on private property (between the B-Box and structure). The estimated cost is approximately \$8,000.00 to replace an entire lead service (watermain to structure). The cost on private and private property is about equal (\$4,000.00 each).

The Village currently waives the connection upgrade fees up to a 1-inch service (most lead services are either 5/8-inch or 3/4-inch) as an incentive to encourage replacement. The connection fees amount to \$1,200.00 (5/8-inch) and \$1,465.00 (3/4-inch). Most new services need to be 1.5" and this incentive has not been very effective. Staff recommends modifying the current policy to waive the connection upgrade fees up to a 1.5" service size. The connection upgrade fees for the 5/8 and 3/4-inch services will remain. The upgrade connection fee for a 1-inch service is \$1,950.00. The Village could waive the \$1,950.00 service connection fee.

A second option the Committee may want to consider is to partner with the property owner to solicit three competitive quotes to replace the lead service (watermain to structure) in its entirety. The lowest responsive quote would be selected and the Village would be responsible for the costs between the main and B-Box. The property owner would be responsible for the remaining costs. If the property owner does not have the funds available, the Village can then pay the full amount and arrange a payment plan with the owner as part of the water billing process. This option would be available Village wide, but limited to residential properties. There would need to be stipulations that if the property is either renovated or demolished and re-built within a five year period, the Village must be reimbursed for our expended funds because these improvements would require a water service replacement. The Committee discussed this option.

Director Kendzior stated another option that the Village could consider is a 50/50 program for the replacement of the lead service from the b-box to the structure. The 50/50 program would be limited to those residences having their lead water service (main to b-box) being replaced by the Village as part of the Underground Utilities program for that year. The resident would be required to get three quotes to replace their lead service from the b-box to the structure and the Village would pay 50% of the replacement cost (or \$2,500 maximum). This program could be initiated with the 2017 watermain program. The 2017 watermain project includes Cleveland avenue, Arbor Court and Lange Court.

- The Village would still waive the 1.5" service connection fee.
- The stipulation that if the property is either renovated or demolished and re-built within a five year period, the Village must be reimbursed for our expended funds because these improvements would require a water service replacement would remain in effect.

The Committee concurred 3-0 with the option for the 50/50 program to replace the lead water service. Staff will bring this back to the next meeting.

Meeting Adjourned at 7:43 pm

The next meeting is scheduled for October 11, 2016

Respectfully Submitted:

Laura Ditanto, Assistant to the Director

Memorandum

To: Water & Sewer Committee

From: Public Works Staff

Date: October 11, 2016

Re: Staff Report

Item 3: Water and Sewer Capital Improvement Projects Updates

- a) 911 & 915 W. Park Avenue Watermain Easements
The two property owners (Mr. and Mrs. Strampel) have failed to sign the Easement Agreements in a timely manner. The Village Attorney is now pursuing condemnation for the easements.
- b) 2016 Underground Utility Improvements Program
The contractor, Trine Construction Corp. has completed the watermain replacement work, including service installations on Johnson Avenue, Merrill Court, Wheeler Court, West Ellis Avenue, East Ellis Avenue and Fourth Avenue at Paddock Lane.
- c) 2017 Underground Utility Improvements Program
Our consultant, Gewalt-Hamilton continues the water main design plans and water main routing concept. The locations for the proposed water main replacement work include Route 45 (just south of Peterson Road), Cleveland Ave., Arbor Ct. and Lange Ct.
- d) North Shore Bike Path/Sunnyside Avenue Drainage Improvements
The construction contract was awarded to Berger Excavating in the amount of \$197,314.40 at the August 9, 2016 Board meeting. The Lake County Stormwater Management Commission and Lake County Division of Transportation will contribute \$30,000 and \$19,080 respectively in reimbursement funding. Construction started in late August and was completed at the end of September. The project included the construction of a 600-foot long drainage swale, 650-lineal feet of storm sewer and the relocation of a segment of the bike path that was adjacent to the drainage swale and storm sewer. This project will reduce flooding impacts to the abutting properties along Sunnyside Avenue.

Item 4: Continuation of Water & Sewer Bill Appeal for 617 Hampton Terrace

At the July meeting, the Committee discussed high water & sewer bill appeals from three properties (15192 W. Rockland Road, 618 Ames Street and 617 Hampton Terrace). Following a thorough discussion and verification that no obvious leaks were found, the Committee decided to test the accuracy of each of the water meters and waive the standard testing fee. Over the course of the last two months, Staff has been unable to get a return call from the owner of 617 Hampton Terrace to schedule a date and time to test the meter accuracy. The amount in dispute is \$619.93 (\$368.91-water and \$251.02-sewer).

It is Staff's recommendation that the appeal be denied and a 12-month payment plan be coordinated with the Finance Director as part of the water/sewer billing process. Similar to the denial of the two high bill appeals at last month's meeting, the water rate will be based upon the CLCJAWA wholesale rate (Village purchase price), which is \$2.68/1,000 gal.

Item 5: Proposed Financial Incentive Program to Encourage Residential Lead Service Line Replacements

It is estimated that there are approximately 375 lead services still within the Village's right-of-way (between the main and B-Box) and approximately 750 lead services on private property (between the B-Box and structure). It is estimated to cost approximately \$8,000.00 to replace an entire lead service. The cost on private and private property is about equal (\$4,000.00 each). The actual cost of

installation will vary from property to property depending upon the location of the water main, alignment of the service line and where the water meter is located within the home.

In continued follow-up to the discussions at the last two month's meetings, the following incentive program to encourage residential lead service replacements is proposed:

- Matching reimbursement funding up to 50% of the construction cost for the private segment, but no more than \$2,500.00.
- The homeowner must receive 3 quotes for the service line replacement work. The reimbursement funding will be based upon lowest responsive quote.
- If the home is torn down and replaced with a new structure, or significantly improved that a new water service is required within a five-year period after receiving reimbursement funds from the Village, the owner will have to pay back a portion of the reimbursement funds received as follows:
 - Within one year: 100%
 - Within two years: 80%
 - Within three years: 60%
 - Within four years: 40%
 - Within 5 years: 20%

Staff will track this using our BS&A software program, which will "flag" properties participating in the reimbursement program.

- The incentive program will be limited to the water main replacement program areas for that given fiscal year.
- The water service connection upgrade fees now will be waived up to a 1.5" service. The fees are currently only waived up to a 1" service.
- The program will begin on May 1, 2017 depending upon funds being allocated in the Village's Budget.
- The proposed annual funding amount will be \$25,000 and will be on a "first come/first serve basis."

This upcoming year's water main replacement program appears to only involve three properties that have lead service lines. It is therefore recommended to also include last year's program areas where there were seventeen homes that had lead service lines. An interesting newspaper article discussing lead service line replacements is also attached.

Item 6: Phosphorus Removal Feasibility Study at Wastewater Treatment Plant

The Village's consultant, RHMG Engineers, Inc. (RHMG) has just completed our Phosphorus Removal Feasibility Study, which is a requirement (Special Condition 19) of our Illinois Environmental Protection Agency (IEPA) National Pollutant Discharge Elimination System (NPDES) Permit for the operation of the wastewater treatment plant (WWTP). The IEPA desires to limit Phosphorus effluent levels from WWTPs in order to prevent eutrophication in the receiving streams, which in our case is the Des Plaines River. The initial requirement is to reduce the Phosphorus effluent limit to 1.0 mg/l by a compliance schedule date of April 1, 2020. On the average, our current Phosphorus effluent limit is approximately 4 mg/l.

RHMG evaluated both enhanced biological and chemical removal options in order to reduce the Phosphorus effluent limit to a minimum of 1.0 mg/l. It was determined that the most cost effective option is chemical removal. The initial capital cost to reduce phosphorus levels is estimated to be just over \$4.5 million, and includes a new chemical building for pumps, piping, meters, instrumentation and material storage, a SCADA system and an additional operator. The feasibility study also identifies the method, timeframe and estimated costs it will take to meet a potential future phosphorus effluent standard of 0.5 mg/l. Please refer to the attached material, which summaries the options evaluated and their costs. We have asked that a representative from attend the meeting to discuss the Study with the Committee members.

As other cities dig up pipes made of toxic lead, Chicago resists



As cities across the nation overhaul their aging water systems by digging up lead water pipes connecting homes to street mains, Chicago administration officials say it is up to individual homeowners to decide whether it is worth replacing the pipes at their own expense. (Chicago Tribune)

By Michael Hawthorne and Peter Matuszak · Contact Reporter
Chicago Tribune

SEPTEMBER 21, 2016, 7:12 AM

As cities across the nation overhaul their aging, increasingly fragile drinking water systems, some municipal leaders are digging deeper to erase a toxic legacy that endangers millions of Americans: lead water pipes connecting homes to street mains.

The growing list includes Milwaukee, Boston, Philadelphia, Pittsburgh, Denver and St. Paul, all of which are adding pipe replacements to municipal construction projects by dipping into local funds, offering homeowners payment plans or taking advantage of low-interest loans funded jointly by federal and state lawmakers. Other cities have plans in the works.

Chicago has more lead service lines than any other city and required them by law until 1986, when Congress banned the use of the brain-damaging metal to convey drinking water. But as Mayor Rahm Emanuel pushes ahead with expensive plans to modernize Chicago's water system, administration officials say it is up to individual homeowners to decide whether it is worth replacing the pipes at their own expense.

Of the \$412 million Emanuel has borrowed from a federal-state loan fund during the past six years for water-related projects, none is going to replace lead pipes.

Instead, more than two-thirds of the money has been earmarked to replace 440 miles of aging water mains — work that helps prevent leaks but can inadvertently increase the chances Chicagoans are exposed to lead in their drinking water.

The Emanuel administration has increased the amount borrowed and number of mains replaced each year, even after a 2013 study of Chicago homes by the U.S. Environmental Protection Agency found that when service lines are disturbed by street work, high levels of lead can flow out of household taps for weeks or months afterward.

"Residents are paying a horrible price for Chicago ignoring overwhelming scientific evidence of health concerns," said Marc Edwards, a Virginia Tech researcher who played a major role in uncovering lead hazards in Flint, Mich., last year and Washington, D.C., in 2003. "If they were honest about the dangers ... it is at least possible the money could be found to do the job right."

In June, the Emanuel administration borrowed another \$120.6 million — the biggest loan deal yet for the mayor's project. Emanuel has emphasized the importance of the work by showing visitors to his City Hall office a bored-out log that once carried water through the Loop, a not-uncommon discovery in the city's oldest neighborhoods.

Each time city crews and contractors dig up a Chicago street to replace a water main, they connect new cast iron pipes to existing lead service lines between the roadway and individual houses. The projects ensure "residents have modern and reliable water service" and provide "the maximum benefit to the greatest number of people," the Department of Water Management wrote in an email response to questions.

Asked why the city doesn't replace lead service lines at the same time, city officials have repeatedly said there is no proof Chicagoans are at risk. "There is no scientific data surrounding the impact of construction on water quality," Gary Litherland, a water department spokesman, wrote in a Sept. 8 email, noting the city announced plans last month to conduct its own research.

The mayor's office declined to answer specific questions. "We are working with the state and federal authorities on these issues and will be reviewing all options to ensure the continued delivery of safe drinking water," an Emanuel spokeswoman said Friday in a prepared statement.

By contrast, after testing in Milwaukee last year found results similar to the EPA's 2013 Chicago study, city leaders there announced plans to begin borrowing money for lead pipe replacements. They also stopped installing new water mains on streets with lead service lines, projects the local health commissioner said pose an "unacceptable and involuntary risk to the public."

The EPA and the U.S. Centers for Disease Control and Prevention say there is no safe level of exposure to lead. Tiny amounts can permanently damage the brains of young children, leading to learning disabilities and violent behavior later in life.

Like other cities, Chicago and Milwaukee add corrosion-fighting chemicals to the water supply that form a protective coating inside lead pipes, helping prevent the metal from leaching out. But the coating can break off if lead pipes are disturbed, according to studies by industry scientists and academic researchers.

Stung by criticism of its slow reaction to the Flint crisis, the EPA has sent a series of letters to state regulators advising them to do more to warn the public about potential health risks from lead pipes and encouraging them to find ways to begin addressing the problem that go beyond the minimum requirements.

Though Chicago and other cities consider service lines to be private property rather than part of the municipal water system, no law or regulation prevents the use of federal money to replace them, EPA lawyers wrote earlier this year in an internal memo shared with states.

"Lead pipes can contaminate water at any point, including on its way into a private home," the memo concluded. "Allowing a public water system to use its funds to replace such pipes is consistent with ... the overall health protections of the Safe Drinking Water Act."

Milwaukee has identified 70,000 properties where lead pipes remain underground. Earlier this month, Mayor Tom Barrett said anyone living in a home built before 1951 should install water filters capable of removing lead. The city also is planning to borrow \$2.6 million from the federal-state loan fund to replace lead pipes, starting with 385 day care centers.

"This is a matter of statewide public health concern for all utilities that have lead service lines," Carrie Lewis, the Milwaukee public works superintendent, wrote in a January letter asking state officials for financial assistance.

Madison, Wis., already has removed nearly all of its lead service lines, in part by offering to pay up to \$1,000 of the replacement costs. Lansing, Mich., charges ratepayers for its replacement program and has developed cheaper and more efficient methods to complete the work. Philadelphia and St. Paul offer no-interest payment plans.

In Boston, residents can consult an online map of lead service lines, and the city offers its own cash incentives. "If the service line is made of lead, you are encouraged to replace it to protect the health of people in the building," the city states in a brochure outlining its program.

Chicago has no such inventory of lead service lines, and the city has asked a Cook County judge to throw out a lawsuit seeking a court-ordered replacement program. Lawyers for the three initial plaintiffs say the city "interfered with their private property" by requiring lead service lines for decades after other cities stopped using pipes made of the toxic metal.

Replacing service lines in Chicago certainly would be daunting given the city's estimate that nearly 80 percent of homes and small apartment buildings are hooked up to the municipal water supply with lead pipes.

If roughly 385,000 lead service lines remain in Chicago, and replacing them would cost \$3,800 on average based on estimates in other cities, embarking on such a program could cost at least \$1.4 billion.

Congress created the Drinking Water State Revolving Loan Fund in 1996 to improve and maintain public water systems. The fund requires states to contribute an amount equal to 20 percent of what each gets annually from the federal program.

This year, Illinois pre-approved \$430 million in federal-state loans for drinking water projects. Of that amount, \$148 million is designated for Chicago, most of it for the water main repairs.

The city will pay back the 20-year loans using money from an increase in water rates approved shortly after Emanuel took office. At interest rates averaging 1.86 percent, the borrowing is significantly less expensive than other debt the city has taken on to fund municipal operations.

A separate tax on water and sewer bills, approved by the City Council last week at Emanuel's request, will help fund city pensions rather than support construction projects.

The first community in Illinois to secure funding for lead pipe replacements through the federal-state loan fund is Galesburg, a downstate city that has struggled for years to adequately maintain its anti-corrosion treatment. U.S. Rep. Cheri Bustos, a Moline Democrat, suggested the idea after the EPA advised Galesburg to distribute water filters to any home where testing found high levels of lead in tap water.

The \$4 million borrowed by Galesburg will replace about half of the 10,000 lead pipes remaining in the city, said Mayor John Pritchard. Homeowners will be asked to sign waivers allowing crews to dig up their yards, with the city focusing initially on properties where high lead levels have been detected in tap water or where a child has been diagnosed with lead poisoning.

"There's money available to take care of the pipes, and it's going to put people to work," Pritchard said. "You would be crazy not to take it."

Alec Messina, director of the Illinois EPA, said the administration of Republican Gov. Bruce Rauner is drafting plans to include service line replacements in more projects throughout Illinois. The state has more lead pipes remaining than any other.

"More states and communities will start looking at this program as part of the solution," Messina said in an interview.

One reason why Chicago and most other cities haven't been required to replace service lines is there is no federal limit on the amount of lead in tap water at individual homes, though the EPA has announced it will propose a "household action level" by year's end. For now, a water utility can be ordered to make repairs only if it repeatedly exceeds a systemwide benchmark intended to gauge the effectiveness of anti-corrosion treatment.

Chicago officials say corrosion control in the city is effective, basing their assurances of safety on 50 federally mandated lead tests conducted every three years.

The Tribune first reported in February that few of the tests were carried out on streets where a water main has been replaced, the vast majority of the homes tested were owned by people who work for or retired from the water department, and none of the tests was conducted in areas of the city where childhood lead poisoning remains a problem.

Since the federal study in Chicago — carried out with the assistance of the water department — research in Milwaukee and other cities also has found spikes of lead in drinking water following the installation of new street mains.

With Chicago at the halfway point of Emanuel's water main replacement program, administration officials last month said they would conduct their own study because, according to a mayoral spokeswoman, "it is misleading at best to say there is federal research concluding that construction causes high lead levels in water."

Volunteers will be enlisted to have their water tested before and after streets are dug up, according to a city news release. Citing pending litigation, the water department on Friday declined to provide a copy of its study protocol.

The city currently advises residents affected by water main replacements to flush their taps for a few minutes any time water hasn't been used for several hours. Between October and February the fliers omitted any reference to lead, the Tribune found, and suggested that homeowners flush taps just once after the water main work was complete.

The city also offers free water testing and since May has been sending residents test kits they can mail to a laboratory for analysis. Results posted online show widely ranging levels in the first liter of drawn water — from less than 1 part per billion to as high as 272 parts per billion.

Jeffrey K. Griffiths, a Tufts University researcher and former chair of the EPA advisory panel on drinking water issues, said the only effective solution is for Chicago and other cities to begin the long, costly work of replacing lead service lines.

Griffiths gives a lecture to students once a year about the history of lead, cautioning them it will be one of the most depressing talks they ever hear.

"Because it's all bad," Griffiths said. "This is a horrible neurotoxin. The amount that should be in your body is zero, and it is very clear what needs to happen for cities to do the right thing. There is no other way around that."

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Village of Libertyville WWTP

Phosphorus Removal Feasibility Study

Executive Summary

The phosphorus removal feasibility study was performed to review and evaluate treatment alternatives that could be implemented at the Libertyville Wastewater Treatment Plant (WWTP) to achieve an effluent total phosphorus concentration of 1.0 mg/l and 0.5 mg/l. Three biological phosphorus removal processes and two chemical removal processes were evaluated.

Biological Phosphorus Removal

- A²O Process
- UCT Process
- Modified UCT Process

Chemical Phosphorus Removal

- Chemical Precipitation
- Chemical Precipitation with upgraded Effluent Filtration (for achieving total phosphorus of less than 0.5 mg/l)

Chemical phosphorus removal with the addition of a metal cations such as alum or ferric chloride was found to be the most cost effective solution and the recommend alternative for the Libertyville WWTP to achieve a total phosphorus effluent concentration of 1.0 mg/l as illustrated in the present worth costs below.

Present Worth Costs Total Phosphorus Effluent Concentration 1.0 mg/l

Alternative	Initial Capital	20 Year Present Worth Cost		
		Capital	O&M	Total
A ² O Process Phosphorus 1.0 mg/l	\$10,254,934	\$8,842,834	\$19,045,000	\$27,887,834
UCT Process Phosphorus 1.0 mg/l	\$11,963,280	\$10,356,380	\$22,063,000	\$32,419,380
MUCT Process Phosphorus 1.0 mg/l	\$11,149,060	\$9,639,361	\$21,604,000	\$31,243,361
Chemical Feed Phosphorus 1.0 mg/l	\$4,510,610	\$3,970,810	\$8,550,000	\$12,520,810

Chemical Precipitation – Chemical precipitation would require the construction of additional chemical feed facilities. The proposed chemical feed point would be into the aeration tanks so that sufficient mixing would occur prior to precipitation and removal in the secondary clarifiers. The chemical feed system would require the addition of new facilities to house the chemical feed pump equipment and bulk storage facilities. Chemical feed distribution piping would also need to be installed for the delivery of the alum or ferric chloride.

The calculated chemical feed volumes needed to reduce the effluent phosphorus from an assumed influent concentration of 6.5 mg/l (based on prior sampling at the plant) to an effluent concentration of 1.0 mg/l are summarized below.

Chemical Feed Summary
Reduce Phosphorus from 6.5 mg/l to 1.0 mg/l

Design Plant Flow	Phosphorus Limit ¹	Alum ² Gallons per Day	Ferric Chloride ³ Gallons per Day
Average Day Flow 4.0 MGD	1.0 mg/l	260	460
Maximum Day Flow 8.0 MGD	1.0 mg/l	550	804

1. Assumes reducing phosphorus from 6.5 mg/l to 1.0 mg/l
2. Liquid sodium aluminate, 38% solids
3. Assumes 38% solution of ferric chloride

Additional sludge amounts are anticipated to range from 300 to 325 pounds per day.

The new facilities for the chemical feed system would include the following components:

- Indoor bulk chemical storage tanks with secondary containment
- Bulk chemical unloading/receiving station for chemical delivery
- Chemical building for new equipment
- Chemical unloading and transfer pumps
- Chemical metering pumps with appurtenances
- Diffuser system for chemical addition point(s)
- Chemical feed piping
- Instrumentation and controls to allow for local operation and control and remote monitoring the SCADA system
- Power supply for new pumps, equipment and instrumentation

The advantages and disadvantages of chemical phosphorus precipitation are:

Advantages:

- Simple operation
- Reliable, predictable treatment and results
- Lower capital and O&M cost

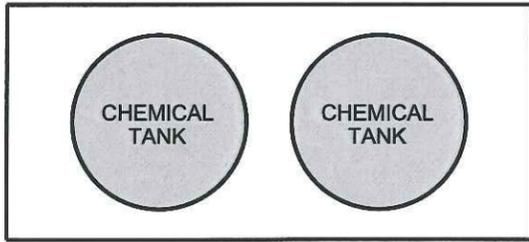
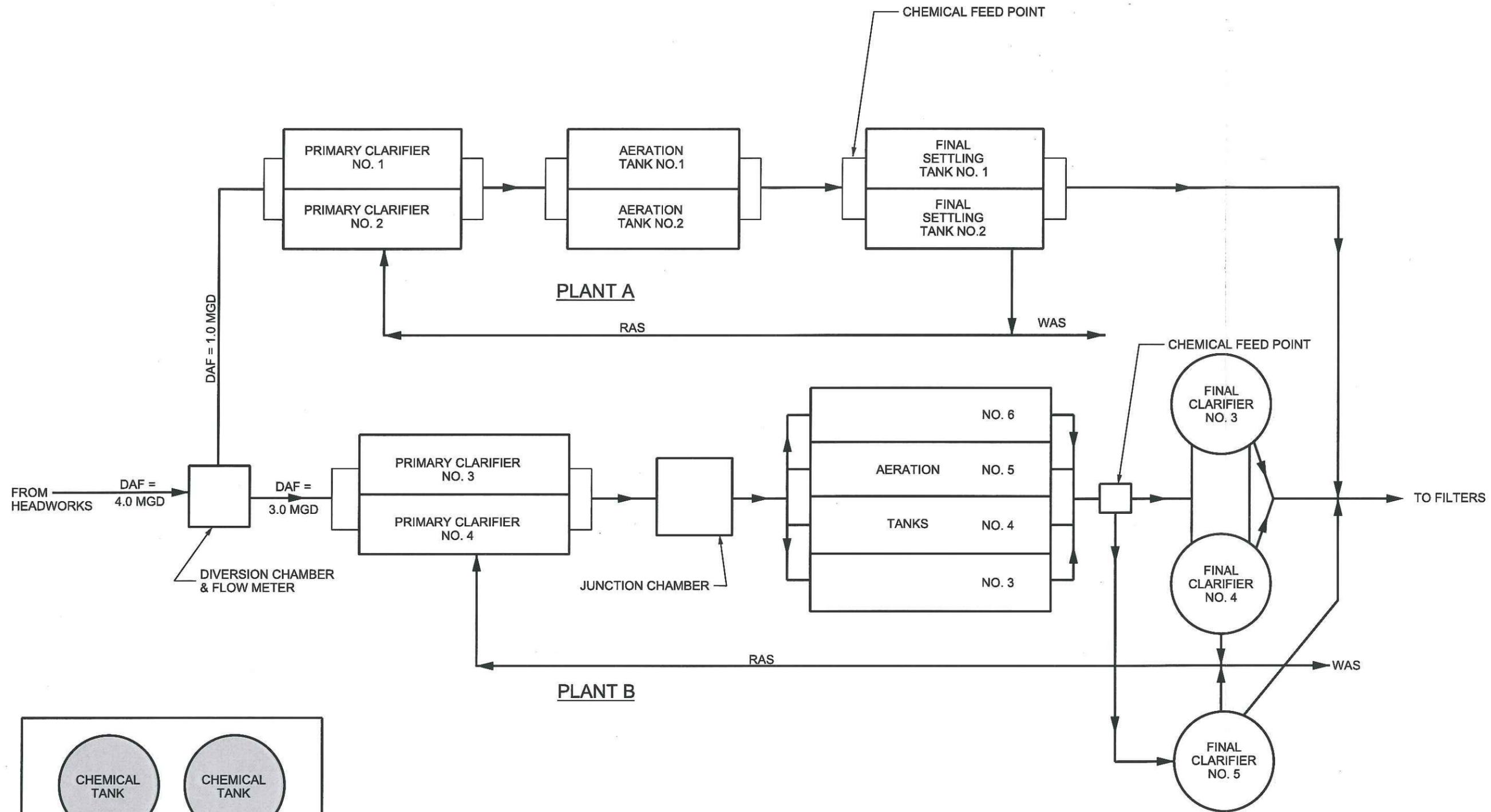
Disadvantages:

- Increased sludge volumes and associated sludge handling and disposal costs
- Ongoing operating costs (chemicals)
- Additional onsite chemical storage and handling
- Maintenance of the chemical feed equipment
- Corrosive nature of the chemicals

Chemical Feed System Requirements

Process Item	Design Parameter
Chemical Receiving Station	Capable to accommodate bulk load shipments of 4,000 gallons
Receiving Pumps	Two (2) bulk truck off-loading pumps to transfer chemical to storage tank
Bulk Storage Tank	Minimum Volume 15,000 gallons FRP construction, flat bottom, dome top Four (4) nozzles; fill, pump suction, drain and overflow Containment volume 110% of storage volume
Chemical Feed Pumps	Three (3) chemical feed metering pumps Average Day: 0 - 20 gallons per hour Maximum Day: 20 - 40 gallons per hour Flow paced delivery Appurtenances: isolation valves, check valves, back pressure valves, pulsation dampers, calibration column and service water connection
Chemical Feed Piping	Chemical PVC pipe Schedule 80 Redundant pipe runs to feed point Outdoor piping to be heat traced Multiple flushing ports Diffuser piping at feed point
Instrumentation	Local control and monitoring by SCADA Pressure monitoring and low/high pressure alarms Flow paced feed for chemical addition Level sensors for bulk storage tank
Building Requirements	Cast in place containment area for bulk tank CMU block walls for building FRP doors, frames, hardware, handrails and grating Corrosion resistant structural members Eye wash station

The process flow schematic for the chemical feed alternative is illustrated in the following figure.



CHEMICAL BUILDING AND CHEMICAL FEED EQUIPMENT

CHEMICAL FEED
 EXISTING FLOW PATTERNS PLANTS A AND B
 CHEM-P → TOTAL EFFLUENT PHOSPHORUS 1.0 mg/l



Present Worth Cost Effective Analysis

As 20 year present worth cost analysis was prepared to provide a capital and operation and maintenance comparison of the alternatives. The results of this analysis are provided here in.

Present Worth Costs

Alternative	Initial Capital	20 Year Present Worth Cost		
		Capital	O&M	Total
A ² O Process Phosphorus 1.0 mg/l	\$10,254,934	\$8,842,834	\$19,045,000	\$27,887,834
UCT Process Phosphorus 1.0 mg/l	\$11,963,280	\$10,356,380	\$22,063,000	\$32,419,380
MUCT Process Phosphorus 1.0 mg/l	\$11,149,060	\$9,639,361	\$21,604,000	\$31,243,361
Chemical Feed Phosphorus 1.0 mg/l	\$4,510,610	\$3,970,810	\$8,550,000	\$12,520,810
Chemical Feed ¹ Phosphorus 0.5 mg/l	\$11,076,364	\$9,921,764	\$6,999,000	\$16,920,764

1. Additional costs to the Chemical Feed Phosphorus 1.0 mg/l alternative.

Amortization Period 20 years

Interest Rate 3%

Service Life

Equipment 20 years
Structures 50 years
Flow Conduits 50 years

Service Life

Equipment 20 years
Structures 50 years
Flow Conduits 50 years

The detailed present worth cost sheets for each alternative are provided in the following pages.



**Chemical Process Flow Option No. 1
Total Effluent Phosphorus = 1.0 mg/l
Present Worth Analysis**

<u>Capital Cost</u>	<u>Initial Cost</u> [1]	<u>20-Year Salvage Value</u>	<u>Salvage Present Worth</u>	<u>Capital Cost Present Worth</u>
Structures	\$701,865	\$421,100	\$233,200	\$468,665
Equipment	\$2,077,522	\$0	\$0	\$2,077,522
Flow Conduits	\$922,870	\$553,700	\$306,600	\$616,270
Design Engineering	\$485,012	\$0	\$0	\$485,012
Construction Engineering	\$323,341	\$0	\$0	\$323,341
Subtotal - Capital Costs	\$4,510,610	\$974,800	\$539,800	\$3,970,810

Operation and Maintenance Cost

	<u>Annual Cost</u>
Salary and Benefits (One additional Operator)	\$156,000
Chemicals and Supplies	\$15,000
Energy (additional costs)	\$7,500
Ferric Chloride	\$275,000
Equipment Maintenance (1.5% of equip. cost)	\$31,163
Sludge Disposal (additional costs)	\$80,000
Lab Expenses	\$10,000
Total Annual Operation and Maintenance Cost	\$574,663
Total Present Worth for O&M	\$8,550,000

Total Present Worth

	<u>Present Worth</u>
Capital Cost Present Worth	\$3,970,810
Operation and Maintenance	\$8,550,000
Total Present Worth	\$12,520,810

Notes:

[1] Includes Contingencies and Contractor's OH&P and General Conditions