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Oshkosh Water Filtration Plant Clearwells Replacement Project

August 23, 2022

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AGENDA

- Project update – March through August 2022
- Clearwells inspection and groundwater sampling results
- Collaboration with Wisconsin Department of Natural Resources (WDNR)
- Clearwells rehabilitation
- Clearwells alternatives comparison
- Compliance schedule
- Next steps

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Clearwells Inspection Findings

May – June: Conduct physical inspections of empty Clearwells

Install groundwater monitoring wells near Clearwells

June – July: Prepare and submit to WDNR Clearwell inspection reports

Develop Clearwells repair strategy

Sample groundwater and analyze for contaminants regulated under the Safe Drinking Water Act (SDWA)

August: Review findings with WDNR

Review project with Common Council

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Clearwells Inspection Findings

- Clearwells are located on hardpan and appear structurally sound, in generally fair to good condition. There is evidence of concrete and metal corrosion. Chlorinated water contributes to corrosion.

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Clearwells Inspection Findings

- Previously installed shotcrete lining is in poor condition.
- Remaining shotcrete is damp in locations and potentially masking cracks. Complete removal of shotcrete is needed to expose, map, and measure unsealed concrete cracks.

Deteriorated Shotcrete Lining

Areas of Damp Shotcrete

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Clearwells Inspection Findings

- Some concrete surfaces are spongey, a common effect after exposure to chlorinated water for many years. Removing the top ½-inch of interior surfaces by blast cleaning prior to applying new corrosion resistant lining is needed.
- Moisture or leaking around pipes at wall penetrations is evident and pipe wall sleeves require replacement.

Damaged Concrete Surface

Previously Repaired Leaky Wall Pipe

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Clearwells Inspection Findings

- Active leaks were visible in the North and Center Clearwells.
- Following inspection, when the Clearwells were returned to service, Plant staff have maintained stored water surface elevations at least 1 foot above the groundwater table to mitigate groundwater infiltration.

Flowing Roof Leak

Flowing Wall Leak

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Groundwater Sampling Results

- Two new, PFAS-free groundwater monitoring wells were installed, one east and one west of the Clearwells.
- Three rounds of samples were analyzed for over 170 SDWA regulated contaminants: microorganisms, disinfectants, organics and inorganic chemicals, radionuclides, PFAS compounds, and other water quality parameters.
  - 20 PFAS compounds analyzed: majority of results below detection limits; a few results too low to make certain quantitation.
- Most results were well below SDWA maximum contaminant levels (MCLs) or below the laboratory test detection limit.
- Some positive results for coliform, fecal coliform; some Standard Plate Count results > 500 colony forming units/milliliter.

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Collaboration with WDNR

"Buried clearwell" is a buried water storage tank located below groundwater table and below floodplain. Watertight buried clearwells do not comply with NR 811.

IF	THEN
Buried cleawell is watertight	Operation of non-compliant tank allowed with additional safeguards.
Buried clearwell needs standard maintenance, like concrete crack repair, to restore watertight condition	Standard maintenance work is not a project requiring WDNR review. Operation of repaired non-compliant tank allowed with additional safeguards.
Buried clearwell needs major repairs including concrete crack repair to restore watertight condition, replacement of interior concrete lining to mitigate corrosion, and/or addition of sloped membrane roof.	Major repair and improvement work is a project requiring WDNR review. At time of WDNR review, all tank deficiencies must be addressed to bring the tank into full compliance with current code. Two possible paths forward are available: 1. Complete major repairs to restore watertight condition and add a downstream treatment system to achieve 4-log (99.99%) virus inactivation. 2. Replace buried tanks with compliant (above groundwater and floodplain) tanks and a pump station to fill the tanks.

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Clearwells Alternatives

- Repair and rehabilitate Clearwells, install new High Lift Pump Station and downstream UV disinfection.
- Construct new at-grade reservoirs, new Intermediate and High Lift Pump Station.
  - Circular pre-stressed concrete reservoirs.
  - Square and rectangular cast-in-place concrete reservoirs.

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Repair and Rehabilitate Clearwells

- **To rehabilitate and improve the Clearwells to meet several NR 811 requirements:**
- Blast clean interior surfaces in preparation for crack repair in new shotcrete lining.
- Install replacement wall pipe penetrations for inlet and outlet piping.
- Install new Clearwells' overflow pipes with retaining walls to permit free discharge along walls with earthen backfill.

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Repair and Rehabilitate Clearwells – Continued

- **To repair the Clearwells to restore watertight condition and rehabilitate structures to meet several NR 811 requirements:**
- Repair concrete cracks with chemical grout injection. For significant leaks, utilize temporary leak drains to create dry conditions for all repairs.
- Blast clean interior surfaces and reline with shotcrete.
- Remove earthen cover from Clearwells' roofs. Install new sloped membrane roofs with access hatches and security tank vents.
- Install interior baffle walls to prevent hydraulic short circuiting.

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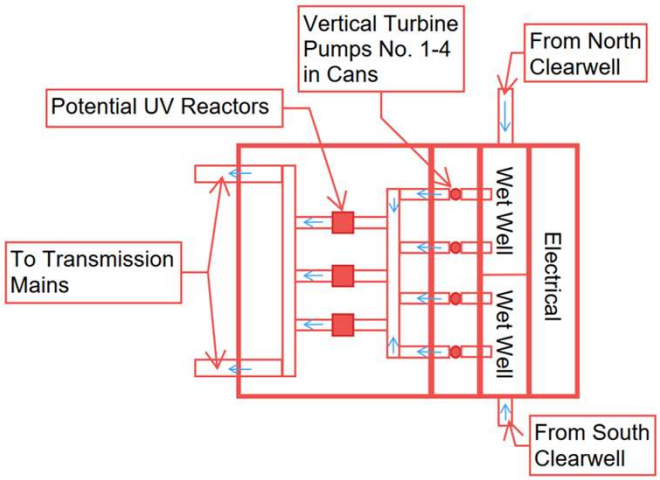
Repair and Rehabilitate Clearwells – Continued

- Construct new High Lift Pump Station in Center Clearwell.
  - Abandon1985 High Lift Pump Station due to insufficient available space to complete improvements and need to install large diameter buried piping with containment.
  - Reuse 1985 High Lift Pump Station space for high lift pumping & distribution system hydraulic surge protection system.
- Add ultraviolet light (UV) disinfection downstream of Clearwells in new High Lift Pump Station.



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Repair and Rehabilitate Clearwells – Continued

ADVANTAGES

- Maintain similar visual impacts.
- Intermediate pumping not required.

DISADVANTAGES

- Requires construction, operation, and maintenance of new treatment system to achieve 99.99% virus inactivation.
- Involves inherently lower-certainty repair methods to provided significantly shorter service life with anticipated major re-investment required in 20 to 30 years.
- Risk of groundwater inflow into Clearwells between inspections.
- Requires more frequent empty Clearwells inspections.

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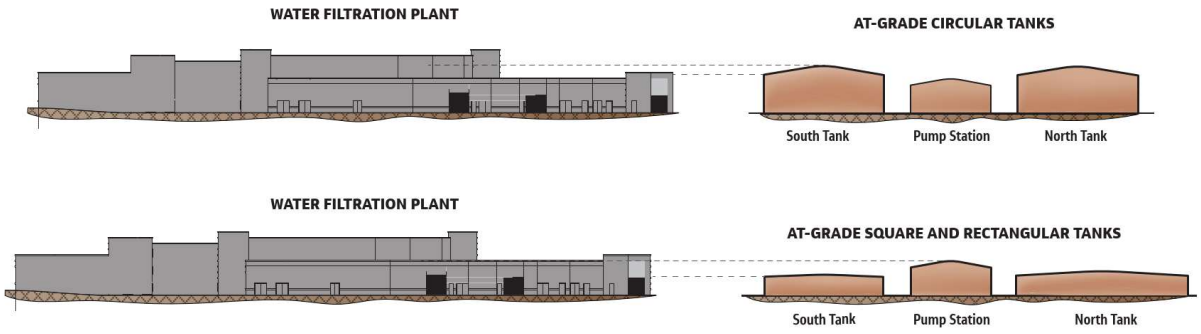
Construct At-Grade Reservoirs



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Construct At-Grade Reservoirs – Continued

ADVANTAGES

- Drinking water protection from potential groundwater and flood water contamination.
- Complies with regulations and aligns with drinking water industry best practices.
- Involves conventional, lower-risk construction methods, with circular pre-stressed concrete lower risk than square cast-in-place concrete.
- Results in accessible facilities that are easier to maintain and repair when needed.

DISADVANTAGES

- Highly visible structures impact lake views.
- Required construction, operation, and maintenance of new Intermediate Pump Station.

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Alternatives Estimated Construction Costs

ALTERNATIVES	ESTIMATED CONSTRUCTION COST
Clearwells Rehabilitation with High Lift Pump Station and UV Repaired storage tanks estimated service life: 20 – 30 years	**$20,911,000**
At-Grade Rectangular Cast-in-Place Concrete Tanks with Intermediate and High Lift Pump Station New tanks estimated service life: 60 – 100 years	**$16,850,000**
At-Grade Circular Prestressed Concrete Tanks with Intermediate and High Lift Pump Station New tanks estimated service life: 60 – 100 years	**$12,699,000**

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Alternatives Life Cycle Cost Comparison

At-Grade Circular Prestressed Concrete Tanks		At-Grade Rectangular Cast in Place Concrete Tanks		Extend Existing Clearwells Service Life	
Estimated Service Life, years	*60 - 100*	*Estimated Service Life, years*	*60 - 100*	*Estimated Service Life, years*	*20 – 30**
Tanks		**Tanks**		**Repaired Clearwells**	
Construction Cost	$5,398,600	Construction Cost	$9,548,300	Repairs Cost	$11,139,000
Annual O&M Costs	$11,000	Annual O&M Costs	$31,200	Annual O&M Costs	$63,500
20-Year Lifecycle Cost	$5,588,600	20-Year Lifecycle Cost	10,088,300	20-Year Lifecycle Cost	$12,122,900
High Lift Pump Station		**High Lift Pump Station**		**High Lift Pump Station**	
Construction Cost	$4,746,100	Construction Cost	$4,746,100	Construction Cost	$4,746,100
Annual O&M Costs	$148,700	Annual O&M Costs	$148,700	Annual O&M Costs	$148,700
20-Year Lifecycle Cost	$7,277,100	20-Year Lifecycle Cost	$7,277,100	20-Year Lifecycle Cost	$7,277,100
Intermediate Pump Station		**Intermediate Pump Station**		**UV Treatment**	
Construction Cost	$2,554,600	Construction Cost	$2,554,600	Construction Cost	$4,4850,000
Annual O&M Costs	$41,100	Annual O&M Costs	$34,200	Annual O&M Costs	$143,000
20-Year Lifecycle Cost	$3,254,600	20-Year Lifecycle Cost	$3,144,600	20-Year Lifecycle Cost	$6,915,000
20-Year Estimated Lifecycle Cost Storage and Pumping	**$16,110,300**	20-Year Estimate Lifecycle Cost Storage and Pumping	**$20,459,400**	20-Year Estimated Lifecycle Cost Storage, Pumping and UV	**$26,315,000**

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WNDR Clearwells Compliance Schedule

By August 31, 2022

✓ Meet with WDNR to discuss inspection reports and Clearwell options

By October 31, 2022

- Provide WDNR status update following Common Council meeting(s)

By January 31, 2023

- Provide WDNR corrective action plan and timeline to address non-complying Clearwells

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NEXT STEPS

1. **Move ahead ozone equipment replacement separate from Clearwells project**
   - Equipment reliability and obsolescence issues remain a concern
   - Purchase ozone equipment 2022
   - Start ozone system replacement construction in 2023
2. **Select Clearwells alternative, complete final design with community input on architectural finishes and site landscaping**
   - Inform permitting agencies of decision
   - Apply for Safe Drinking Water Loan Program funding assistance

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Questions and Discussion

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