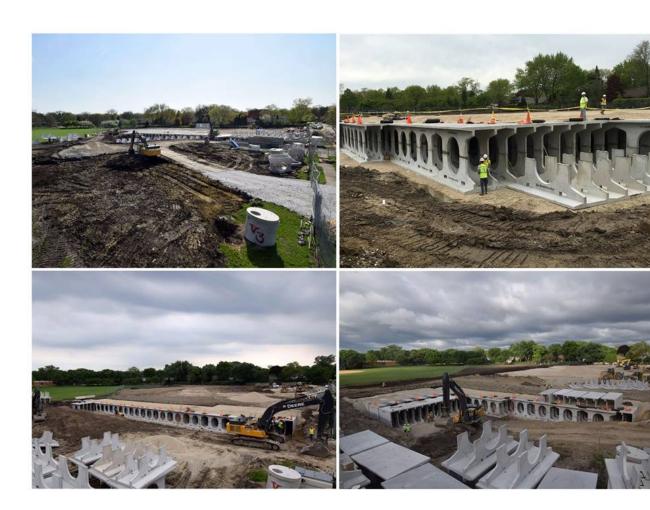
Underground Stormwater Detention and Rainwater Harvesting System for Northbrook Park District

Brett Holmes, P.E., CPSWQ





- Recognized by Storm Water
 Solutions Magazine as a Top
 Project Winner for 2017.
- Won the Illinois Section
 ASCE Outstanding Civil
 Engineering Achievement
 under \$10 Million, ACEC Illinois Engineering
 Excellence, and Friends of
 the Chicago River Green
 Ribbon.



Topics to be discussed

- Northbrook stormwater history
- Project overview
- Site constraints and stormwater detention design considerations
- Opportunities to incorporate green infrastructure
- Importance of collaborations, negotiations, and public outreach
- Utilization of technology to maximize project benefits





Wescott Park Stormwater Management Project

Owner: Village of Northbrook and Northbrook Park District

Engineering Firm: Baxter & Woodman

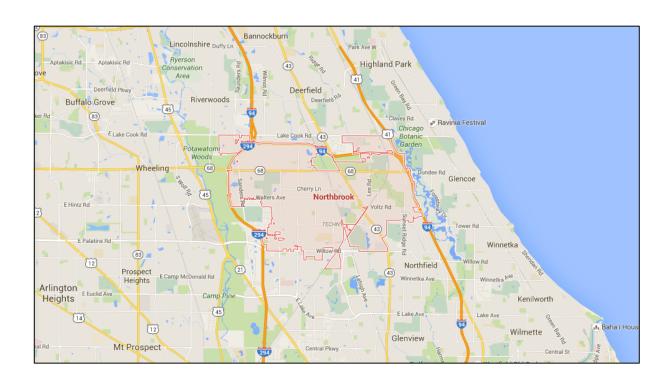
General Contractor: V3 Companies of Illinois

Location: Wescott Park, located at 1820 Western Avenue, Northbrook, Illinois

Design Features: Stormwater Storage and Rainwater Harvesting



Village of Northbrook



- Cook County, IL
- Population: 33,170
- 13 Square Miles
- 25 Miles NW of Chicago



Master Stormwater Management Plan

1st Edition

- Created in response to 1982 and 1987 flood events
- Approved in 1993

1996 and 2002 Updates

- Included updated costs
- Reflected completed projects

2011 Update

- Addendums added in 2012 & 2015
- In total, 31 potential projects included



Wescott Park Stormwater Detention





Flooding Issues







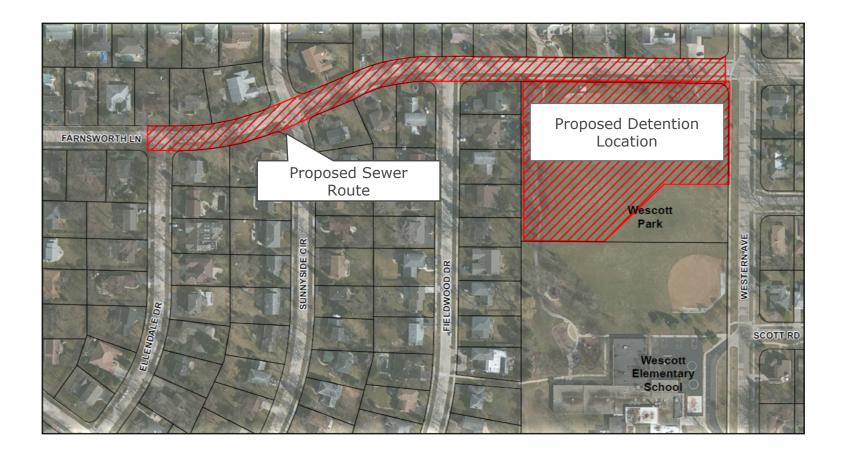
Study Phase



Ten homes flood in 25-year storm event

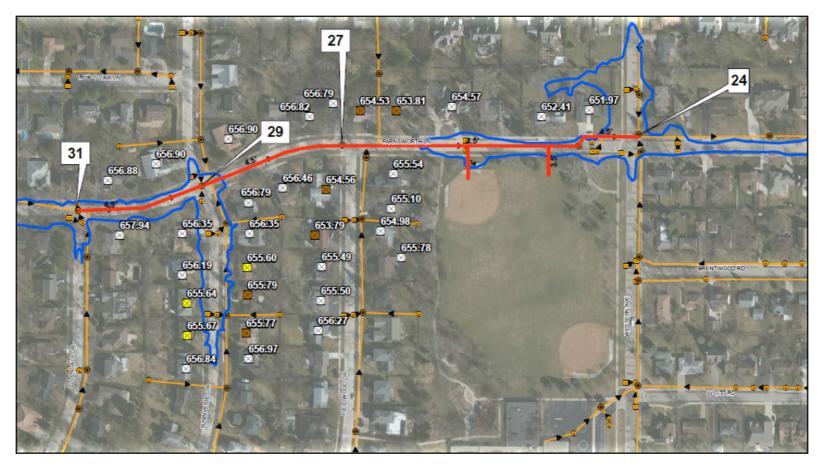


Conclusions





Proposed Conditions



25-year flood protection for all homes



Design and Time Restraints

School and Park District Coordination

- Agreement between Village and Park District
- Defined:
 - Construction limits
 - Project schedule
 - Responsibilities
- Irrigation system to be provided



July 22, 2014

Village of Northbrook 1225 Cedar Lane Northbrook, IL 60062 Northbrook Park District Northbrook, IL 60062

<u>Letter of Understanding</u> Wescott Park Stormwater Storage Facility

This Letter of Understanding has been prepared, in duplicate, to memorialize discussions between the Village of Northbrook ("Village") and the Northbrook Park District ("Park District") concerning the final engineering design, construction and maintenance responsibilities associated with the proposed Wescott Park Stormwater Storage Facility ("Project"). It is understood that:

- The Project scope will include the final engineering design and construction of an approximate 23
 acre-foot underground detention vault at Wescott Park, storm sewer conveyance & inlet improvements, restoration of the grass athletic fields & roadway pavement and all other related
- The footprint of the underground detention vault will be entirely located on the Park District's portion
 of Wescott Park (north 375-feet). The vault footprint will be placed closer to the west property line
 just to the east of the existing bituminous pathway) in order to avoid conflicts with the existing landscaping along the Western Avenue frontage.
- The Park District desires that the south ball field be available for activity use and programming during construction. This may result in the footprint of the underground vault being extended further westward and under the existing bituminous pathway.
- 4. In lieu of providing additional vehicle parking along Farnsworth Lane, an enhanced irrigation and underdrain system for the athletic fields will be included in the Project.
- 5. The Village will be solely responsible for the final engineering design, obtainment of outside agency permits, preparation of construction documents (plans and specifications) and cost estimates. The Park District will be given the opportunity to review the plans and specifications, in particular regarding the athletic field lawn restoration and irrigation & underdrain systems, at the 50%, 75% and final completion stages, with comments incorporated at each stage.
- 6. The Village will also be solely responsible to entirely fund the Project design, construction and
- 7. The anticipated project schedule is:
- September 1, 2014 March 1, 2016; Final engineering design, solicitation of competitive contractor bids and construction contract award.

 • March 1, 2016 – December 31, 2016; Construction.

PRESIDENT		BOARD OF TRUSTEES		VILLAGE CLERK	VILLAGE MANAGEI
Sandra E. Frum Nahrstadt	James A. Karagianis	is A.C.Buehler III	Michael W. Scolaro	Debra J. Ford	Richard A.
- Yam magn	Todd A. Heller	Kathryn L. Ciesla	Robert P. Israel		



Project Funding

- MWRDGC applied for funding to Cover
 Incremental Cost of Rainwater Harvesting
 System
- Intergovernmental Agreement



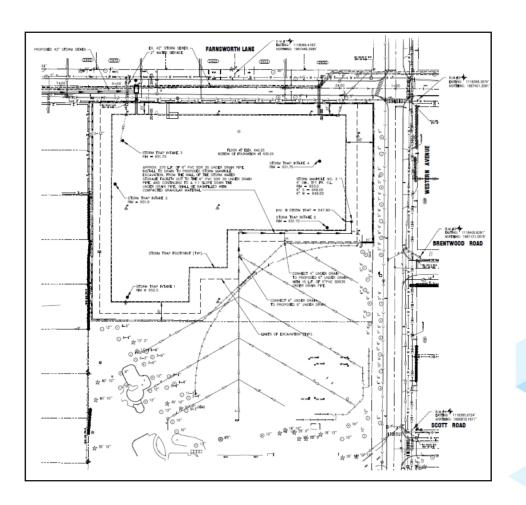


Design Phase

- Began fall of 2014
- Estimated cost: \$10.3M

Main Components

- 23 ac-ft underground detention
- 42-inch diameter storm sewer
- High capacity inlets
- Restrictor
- Irrigation system for ballfield





Underground Detention Design

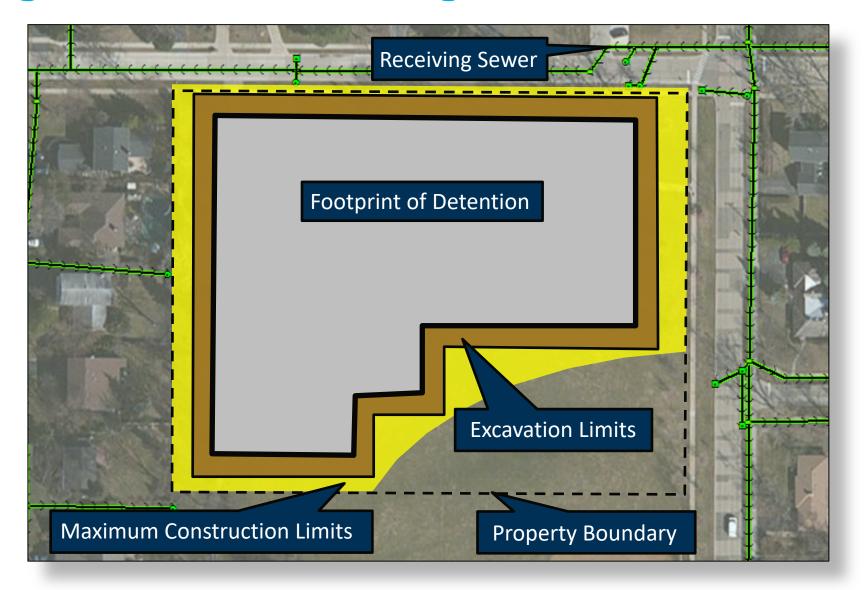
Design Considerations

- •Height and footprint dictated by site constraints
- •Minimum HS-20 loading
- •8-month construction window
- •Expected service life and product warranty
- Cost





Underground Detention Design





Underground System Comparison

StormTrap DoubleTrap

- Modular, precast concrete system
- 93% efficient storage

Corrugated Metal Pipe

- Storage in circular CMP and void space of backfill
- 86% efficient storage
- Durability concerns

Chamber With Reinforced Stone Piers and Walls

- Structurally supported by reinforced stone aggregate
- 64% efficient storage

Cast-in-Place Concrete

- Efficient storage
- Requires structural design
- Longer construction time

Plastic/Resin Systems

- Modular
- Height limitations



StormTrap DoubleTrap System

- Modular, precast concrete system
- 2'-2" to 15'-0" in height
- Innovative design which facilitates quick and efficient installations and minimizes the detention footprint
- Does not rely on void space storage
- 50-year warranty





Pre-Construction Rendering





Rainwater Harvesting System

Village authorized B&W to move forward with design in August 2015

•Concept:

Use detained water for irrigation

Automatically drain StormTrap in advance of large storms

Storage in StormTrap

Pump from StormTrap

Irrigation



Illinois Department of Public Health

Requirements for Conditional Approval

- NSF 350 Standards
- Monthly testing for E. coli for one year
- Limited irrigation hours
- Requirements for spigot

NSF 350 STANDARD					
	MAX	AVG			
Turbidity	5	2			
TSS	30	10			
CBOD	25	10			
E. coli	200	2.2			
Odor	Non-Offensive				
pН	6.0 – 9.0				



Stormwater Management System

Pre-Treatment Sedimentation

Storage in StormTrap

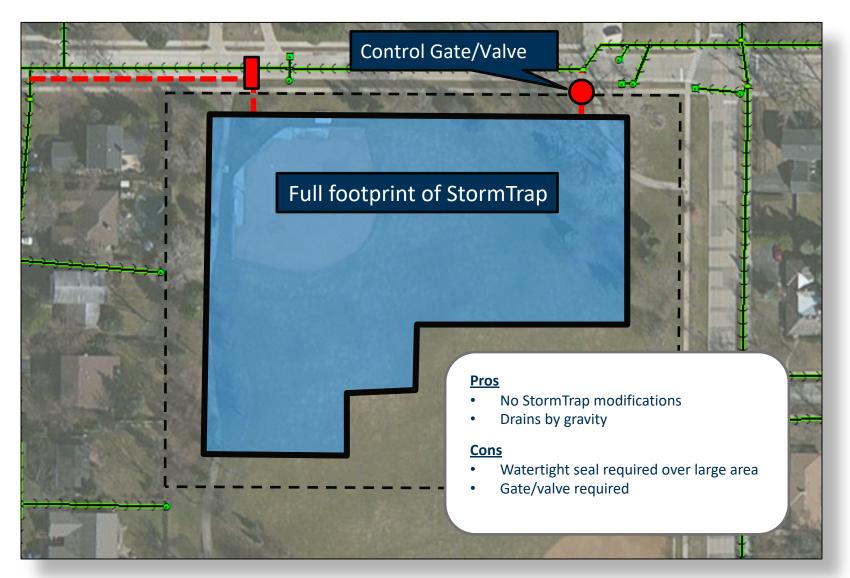
Pump from StormTrap

UV Sanitization System

Irrigation

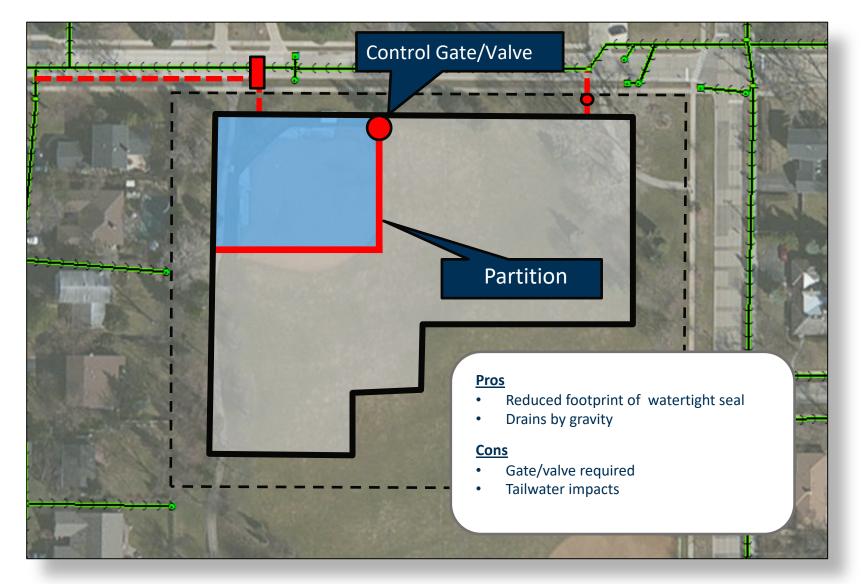


Storage Configuration – Option 1



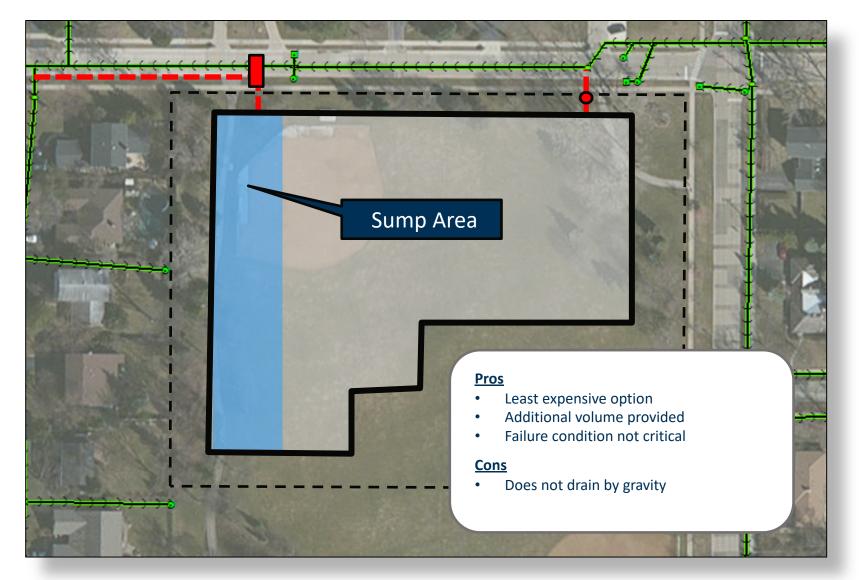


Storage Configuration – Option 2





Storage Configuration – Option 3



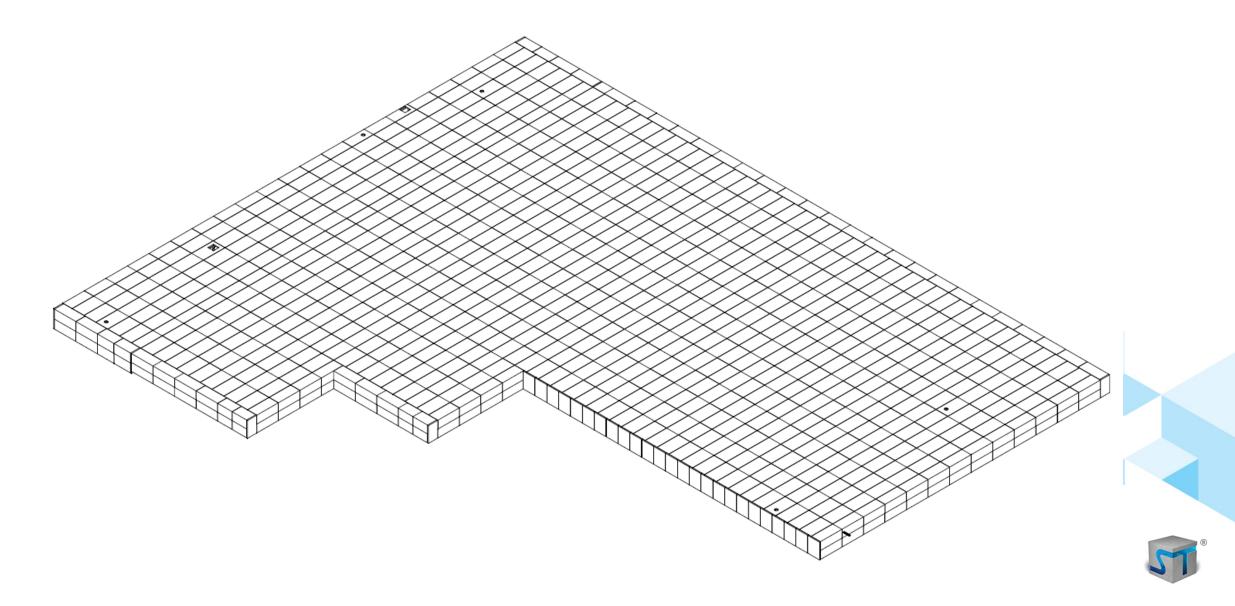


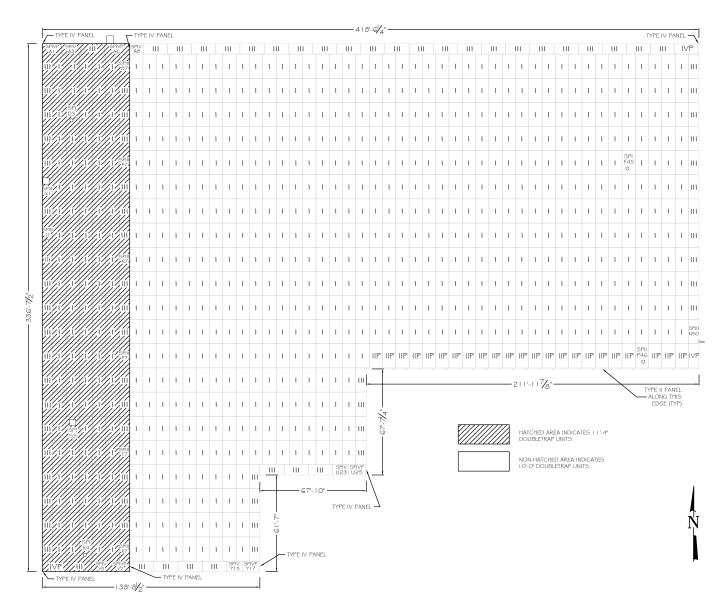
- StormTrap DoubleTrap divided into two sub sections
- 11'- 4" height in sump area, 10'- 0" in remainder of structure
- Modular units placed on stone foundation
- Number of pieces: 1,722
- Total water stored: 23.7 acre feet





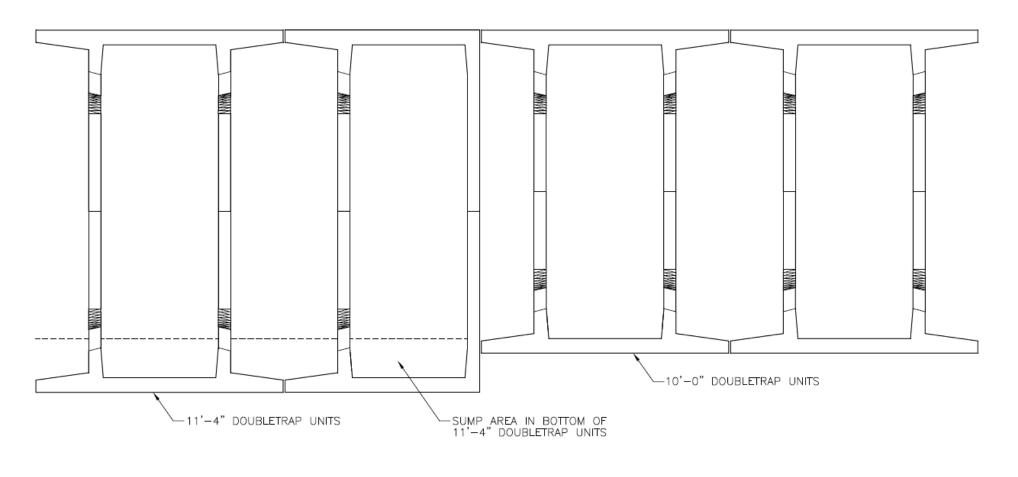








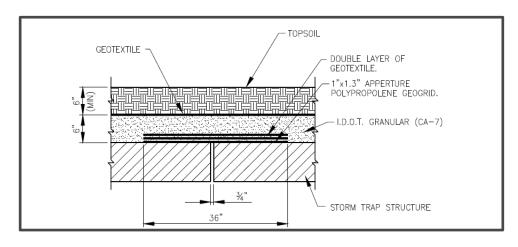








System Design and Functionality – Roof Inflow









System Design and Functionality – Watertight Seal

- System sealant type joint
- Joints are sealed with Xypex
 Patch'n Plug hydraulic cement
 compound
- Sealed joints were tested following construction

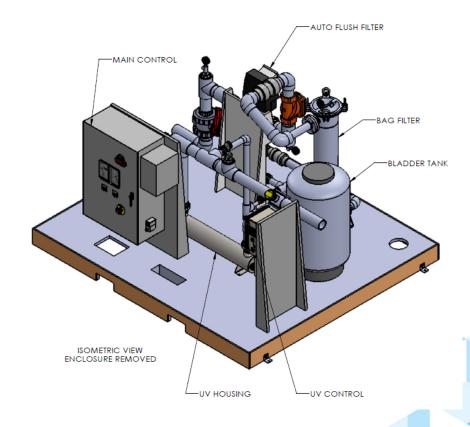






UV Sanitization System

- Additional pre-filtration
- UV radiation kills bacteria and pathogens
- Minimal contact time required
- Non-chemical
- No odor





System Controls and Automation

- Automated control system
- Utilizes online weather forecast data
- Pumps stored water to the downstream sewer system in advance of large storms
- Onsite touch screen controls
- Web interface to monitor system remotely





















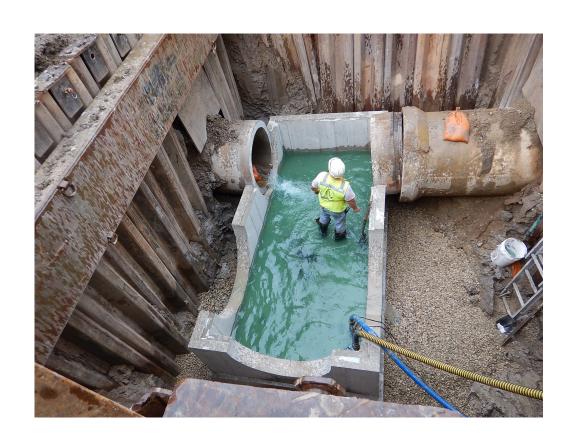


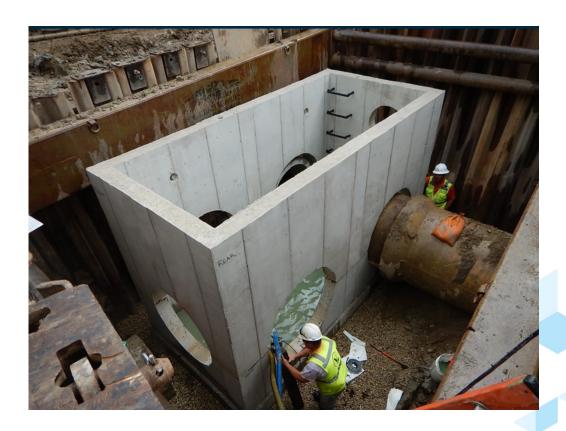


























Wescott Park Time-Lapse





Questions?

Thank you

Brett Holmes, P.E., CPSWQ 815 405 3697 | bholmes@stormtrap.com

