



Engineering & Public Works Department

SUBJECT: Pre-Purchase of Pre-Cast Concrete Units for the Neighborhood Storage Project

MEETING DATE: November 26, 2019

FROM: [Brigitte Berger-Raish](#), P.E. Director of Engineering and Public Works
[Dan Manis](#), P.E., Village Engineer
[Ryan Kearney](#), P.E., Project Manager

BUDGET IMPACT: TBD

Recommended Motion

Move to waive competitive bids for the purpose to negotiate terms with StormTrap, Inc for the pre-purchase of pre-cast concrete units for Phase 1 of the Neighborhood Storage Project at Community Playfield.

Background

The first underground storage system to be built as part of the Neighborhood Storage project is at Community Playfield. Construction is anticipated to begin next spring, with the majority of the work taking place in summer when school is out.

One of the most important design considerations for this project is the type of underground vault system that will be utilized. There are many factors that influence vault design including cost, vault footprint, design life, system performance and ease of installation, among others. Early in the design phase, Baxter and Woodman, Inc, underwent a detailed evaluation of various detention systems. The results of their analysis is summarized in the attached memos.

Discussion

The consultants reviewed seven different detention systems and ultimately recommend StormTrap for the vault design for all three storage locations at Community Playfield, Hibbard Park and Thornwood Park. All three sites have very tight footprints, and StormTrap is able to provide the required storage (810,000 cubic feet at Community Playfield) in the smallest construction footprint. StormTrap has also been widely used in the Chicagoland area for similar underground storage projects. Most recently, this system was used in Northbrook, Elmhurst and Glenview.

In addition, StormTrap is superior to the other vault systems in the areas of longevity and performance. Finally, because StormTrap is so widely used in this area, there are many local contractors who are familiar with the product. This will hopefully result in a large pool of contractors who are interested in bidding on the construction. For these reasons, Village staff and the consultants recommend sourcing StormTrap as the supplier for the pre-cast concrete vault system.

In addition, Village staff and the consultants recommend pre-purchasing the vaults directly with StormTrap instead of including the product in the construction contract. Below is a list of advantages of pre-purchasing the material:

- Schedule: early production ensures that the 2,200 vault pieces will be available for construction next summer;
- Contract terms: Village will have the opportunity to negotiate the contract terms and conditions directly with StormTrap rather than having to work through a general contractor;
- Cost: contracting directly with StormTrap will eliminate the general contractor's markup which could range from 10% to 15% (the estimated value of the StormTrap purchase is \$5 million). In addition, securing a contract with StormTrap in 2019 allows the Village to lock in the current rates.

Assuming the Village Board approves the recommendation to waive the competitive bid process and negotiate directly with StormTrap, the contract with StormTrap will be included on the November 26, 2019 Village Board agenda.

Budget Impact

The pre-purchase of the StormTrap product will initially be paid for from reserves and which will be repaid after the issuance of debt.

Documents Attached

1. Memorandum from Baxter and Woodman, Inc. Evaluating Underground Detention Systems
2. Memorandum from Baxter and Woodman, Inc Recommending the Village Pre-Purchase Vault System with StormTrap for Community Playfield

TECHNICAL MEMORANDUM

DATE: 4/5/2019

TO: Brigitte Berger-Raish, P.E. – Director of Public Works and Engineering,
Village of Wilmette, IL

FROM: Matt Moffitt, P.E., CFM, CPESC

SUBJECT: Underground Detention Systems Evaluation – Community Park

The purpose of this memorandum is to present the results from an evaluation of five underground detention system alternatives for potential future installation at 3 park sites within the Village of Wilmette.

Project Background

B&W contacted various vendors of underground detention systems to obtain preliminary cost estimates and layouts of underground detention storage products. Once the cost estimates and layouts were received, B&W compiled the data and normalized the cost estimates with common price categories in order to provide product-to-product comparisons for the Village. This summary memo being provided to the Village so they can make a vendor selection for the basis of design for the proposed underground detention systems.

B&W sought to obtain cost estimates from the vendors for a Base Storm Sewer System Configuration and an Optimized Storm Sewer Configuration for the Community Park and Thornwood park sites. In addition, B&W sought to obtain cost estimates for a Base Storm Sewer System Configuration and an Optimized Storm Sewer Configuration at Thornwood Park in the Village of Wilmette. The information provided by the vendors for both locations and configurations has been included in the attachments to this memorandum. As the results of our evaluation were found to be similar for both locations and configurations, only the Community Park Optimized Storm Sewer Configuration results are presented in this memorandum as a sample of the evaluation.

An underground detention system is also being planned at Hibbard Park. There is limited space where an underground detention system could be installed at Hibbard Park making it the primary design constraint. The costs of the underground detention systems at Hibbard Park per unit of storage provided are expected to be similar to those found for Community Park and Thornwood Park. Suitable underground detention systems for Hibbard Park are expected to be ones with minimum system footprints, which are typically concrete structure systems.

Site Location - Community Park

The proposed location of the underground detention system is bounded by an east-west pedestrian path on the north; Meadow Drive North on the south; Wilmette Junior High School on the west; and Highcrest Middle School on the east. Community Park is bordered by residential properties on the south and north and the schools on the east and west. There is roughly 440,000 square feet (a little over 10 acres) of parkland at the location where an underground detention system could be installed. The current uses of the parkland, at the southeast corner where the underground detention would be located, are open (park) space and soccer fields.

Based on hydraulic modeling of the tributary storm sewer system, the Community Park underground detention system would need to have an available active storage volume of 18.6 acre-feet (about 810,000 cubic feet). The average ground elevation in the area of proposed detention system is approximately elevation 622. From the modeling, the active detention storage volume would need to be provided by the system between elevations 613.9 and 619.7. The bottom of the excavation to install the detention system would be on average about 9 feet below grade. In all cases, other water quality structures will be installed on the inflow storm sewer to trap sediment prior to entering the underground detention system.

A subsurface exploration and geotechnical engineering report, dated January 28, 2019, was prepared by ECS Midwest, LLC for the Community Park site. In general, soil borings from the subsurface exploration found layers of silts, clays and sands overlying a deep layer of clay that starts roughly at ten feet below grade. The geotechnical engineering report recommended that the estimated long term groundwater level of 4.5 feet below grade be considered in the design of the underground detention system. As noted in the geotechnical engineering report, it is anticipated that the in situ soils do not contain elevated concentrations of contaminants of concern. Excess excavated soils are expected to be accepted at "clean construction and demolition debris" (CCDD) disposal sites in accordance with State of Illinois regulations. Findings from recent subsurface explorations and geotechnical engineering reports for the Thornwood Park and Hibbard Park sites are generally similar at findings of the Community Park site.

Vendor Estimates and Normalization of Costs

B&W contacted five underground detention system vendors to provide preliminary level cost estimates for the installation of their proposed systems at Community Park. Estimates were provided by StormTrap, Contech Engineering Solutions, LLC (Contech), Welch Bros., Inc. (Welch Bros.), GeoStorage Corporation (GeoStorage), and StormTech, a Division of Advanced Drainage Systems, Inc. (StormTech).

Common pay items were normalized by B&W against typical unit prices for those items. Earth Excavation (Haul Excess Offsite), Backfill (Aggregates and Excavated Stockpiled Materials), Concrete Base Pad and Site Restoration were the pay items that were normalized. The remaining vendor-supplied estimate items for the systems were consolidated in the pay items Detention System Materials and Detention System Installation for evaluation.

The following typical unit prices were used by B&W for the common pay items:

- Earth Excavation (Haul Excess Offsite) - \$50/Cubic Yard
- Backfill (Aggregates and Excavated Stockpiled Materials) - \$50/Cubic Yard
- Concrete Base Pad - \$9/Square Foot
- Site Restoration - \$6/Square Yard

A 20% allowance was applied to the construction cost subtotals for contingency.

Many of the underground detention systems include the voids in the aggregate backfill as part of their counted detention volume. There are concerns in relying on this approach as the voids have potential to clog or fill in with no opportunity for maintenance. Additionally, there is concern that the stormwater may not be able to migrate into the extent of the proposed available void space quick enough to be fully effective in responding to the hydraulic needs of the system. For these reasons, this analysis considers aggregate backfill void space a bonus feature and not acceptable to provide for the base volume.

Tables showing comparisons of the various underground detention systems proposed by the vendors and their costs normalized by B&W are included in Attachment A and Attachment B respectively.

Contech

The Contech underground detention system consists of a connected system of aluminized corrugated metal pipe and structures, fabricated on-site and off-site, that are typically installed on an aggregate base. The installed Contech system has aggregate backfill as the initial backfill around and covering the corrugated metal pipe and structures. The rows of the metal pipe are installed with aggregate between them, so differential ground settlement between rows of units can be a concern. Above the initial covering aggregate, excavated stockpiled soil can be used to return the installation site to prior grade.

The system proposed by Contech has a footprint of 363 feet by 510 feet (about 4.2 acres). The system would use 69" diameter aluminized CMP pipe. The system would provide 18.6 acre-feet (810,216 cubic feet) of active storage volume, which meets the amount required. The normalized system cost with contingency is \$8,742,200, assuming no special pipe coating due to site specific soil conditions is required.

The cost estimates and related information that was provided by Contech is included in Attachment D.

Contech Pros

- Least expensive of the vendor systems based on normalized pricing.
- Can manufacture some components onsite which reduces lead times.
- Features the moderate design life expected of aluminized metal structures
- The units are designed for HS-25 loading (tri-axle truck traffic with a 10,000 pound front axle load and two 40,000 pound loads at the rear axles).

Contech Cons

- Second largest installation footprint of the systems evaluated.
- Differential ground settlement between rows of units can be a concern.



Picture 2: Contech System Installation

StormTrap

The StormTrap underground detention system consists of a connected system of modular precast concrete units that are installed on a cast-in-place concrete base pad. The installed StormTrap system has aggregate backfill below the base pad and as the initial backfill around and covering the precast concrete units. The modular units are installed in direct contact with adjacent rows of modular units, so differential ground settlement between rows of units is not a concern. Above the initial covering aggregate, excavated stockpiled soil can be used to return the installation site to prior grade.

The system proposed by StormTrap has a footprint of 387 feet by 399 feet (about 3.5 acres). The system would use SingleTrap modular units that are 5'-8" in height. The system would provide 18.6 acre-feet (810,395 cubic feet) of active storage volume, which meets the amount required. The normalized system cost with contingency is \$9,808,700.

Note that the StormTrap vault can likely be value engineered to place the SingleTrap modular units on a stone base instead of a concrete base; and the resultant cost should be within 5% of the Contech detention system. .

The cost estimates and related information that was provided by StormTrap is included in Attachment C.



Picture 1: StormTrap System Installation

Storm Trap Pros

- Second least expensive of the vendor systems based on normalized pricing.
- Price could be reduced by using an aggregate base rather than a concrete base, pending site conditions.
- Requires the smallest installation footprint of the systems evaluated.
- Features the longer design life expected of concrete structures.
- Differential ground settlement between rows of units is not a concern.
- The units are designed for HS-20 loading (tri-axle truck traffic with an 8,000 pound front axle load and two 32,000 pound loads at the rear axles).

Storm Trap Cons

- Lead time for manufacturing can be longer than some systems.

Concrete Box Culverts (Welch Bros.)

The concrete box culvert underground detention system consists of a connected system of precast reinforced concrete box culverts that are typically installed on an aggregate base. The installed concrete box culvert system has aggregate backfill as the initial backfill around and covering the

concrete box culverts. The system uses a pre-cast concrete bottom, which is similar to the concrete base pad being used for normalizing the detention systems pricing. The box culvert sections are installed in direct contact with or very near adjacent rows of box culvert sections, so differential ground settlement between rows is not typically a large concern. The aggregate backfill is typically not used as additional storage with the concrete box culvert system, because the standard concrete box culvert sections form a sealed detention chamber(s). Above the initial covering aggregate, excavated stockpiled soil can be used to return the installation site to prior grade.



Picture 3: Concrete Box Culvert-Type System Installation

The system proposed by Welch Bros. has a footprint of 367 feet by 436 feet (about 4.2 acres). The system would use the 20-foot wide by 5'-6" high pre-cast concrete box culvert sections. The system would provide 18.5 acre-feet (807,400 cubic feet) of active storage volume. Although the active storage volume provided by Welch Bros. is slightly less than required, we feel a small increase in the size of the proposed system would be achievable with design development by the vendor. The normalized system cost with contingency is \$11,242,100.

The cost estimates and related information that was provided by Welch Bros. is included in Attachment E.

Welch Bros. Pros

- Requires the second smallest installation footprint of the systems evaluated.
- More bidding competition from suppliers as box culvert sections are standard pre-cast sections also sold by vendors other than Welch Bros.
- Features the longer design life expected of concrete structures and can be replaced or repaired with non-proprietary product.

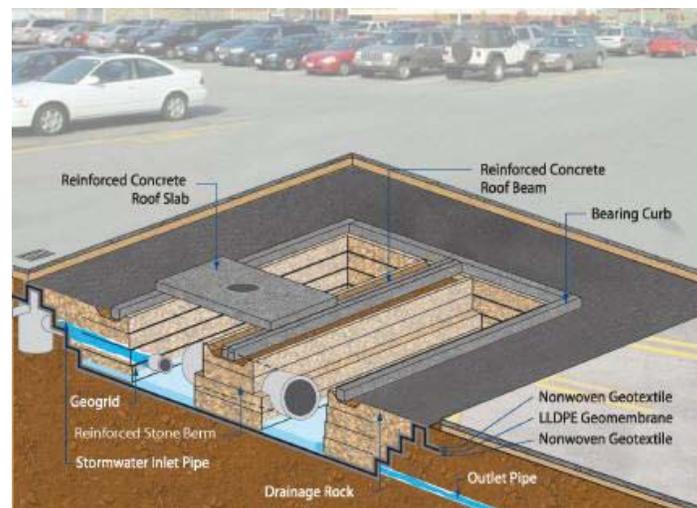
- The units are designed for HS-20 loading (tri-axle truck traffic with an 8,000 pound front axle load and two 32,000 pound loads at the rear axles).

Welch Bros. Cons

- Pricing from this vendor is in middle of systems evaluated.

GeoStorage

The GeoStorage. underground detention system consists of reinforced walls and piers that are constructed with open graded stone overtopped by precast concrete planks to provide a roof for the system. The precast roof planks are installed in direct contact with adjacent roof planks, so differential ground settlement between sections of storage is not a concern. The open graded stone walls and piers provide additional storage capacity in the system. The outer walls and bottom of the system are typically lined with a geomembrane. A concrete base pad was added to the GeoStorage price estimate for the purposes of price normalization of the systems. The installed GeoStorage system has aggregate backfill as the initial backfill around the structure and covering the concrete roof planks. The aggregate backfill is not used as additional storage with the GeoStorage system, but the open graded stone walls and piers are used for additional storage. Above the initial covering aggregate, excavated stockpiled soil can be used to return the installation site to prior grade.



Picture 4: GeoStorage System Illustration

The system proposed by GeoStorage for the Community Park Base Storm Sewer Configuration was extrapolated by B&W for the Community Park Optimized Storm Sewer Configuration, because GeoStorage did not provide designs for the optimized configurations. The GeoStorage system would be expected to have a footprint of about 329 feet by 512 feet (about 3.9 acres). The system would be expected to use 5.8' high chambers comprised of geosynthetic reinforced stone chambers with a reinforced concrete slab on top. The extrapolated system would provide 18.5 acre-feet (805,690

cubic feet) of active storage volume, which meets the amount required. The normalized system cost with contingency is \$11,892,000.

The cost estimates and related information that was provided by GeoStorage is included in Attachment F.

GeoStorage System Pros

- Features the moderate design life expected of concrete and reinforced aggregate structures.
- Differential ground settlement between sections of storage is not a concern.
- The units are designed for HL-93 loading (tri-axle truck traffic with an 8,000 pound front axle load and two 32,000 pound loads at the rear axles; lane load is also applied simultaneously with the truck load).

GeoStorage System Cons

- Second most expensive of the vendor systems based on normalized pricing.
- There are no known installations of this type in the region

StormTech

The StormTech underground detention system consists of a connected system of elliptical arch segments, made of polypropylene and polyethylene resins, and are typically installed on aggregate base. A concrete base pad was added to the StormTech price estimate for the purposes of price normalization of the systems. The installed StormTech system has aggregate backfill as the initial backfill around and covering the arch segments and appurtenant structures. The rows of the arch segments are installed with aggregate between them, so differential ground settlement between rows can be a concern. Some of the aggregate backfill is used as additional storage within the StormTech system. Storage in the aggregate backfill is typically needed by StormTech systems, because the available sizes of their arch chambers are considerably smaller than the chambers of other underground detention systems and the in-aggregate storage volume compensates for the smaller in-chamber storage volume. In order for the backfill to provide the intended storage, the installation of an impermeable liner around the excavation cavity is expected due to the long term groundwater level identified in the project's geotechnical report. Above the initial covering aggregate, excavated stockpiled soil can be used to return the installation site to prior grade.

The system proposed by StormTech has a footprint of 363 feet by 727 feet (about 6.1 acres). The system would use the MC-3500 chambers that are 45" high. The system would provide 18.6 acre-feet (810,362 cubic feet) of active storage volume, which meets the amount required. The normalized system cost with contingency is \$13,772,400.

The cost estimates and related information that was provided by StormTech is included in Attachment G.

StormTech System Pros

- Features the moderate design life expected of plastic structures
- The units are designed for HS-20 loading (tri-axle truck traffic with an 8,000 pound front axle load and two 32,000 pound loads at the rear axles).

StormTech System Cons

- Most expensive of the vendor systems based on normalized pricing.
- Largest installation footprint of the systems evaluated.
- Differential ground settlement between rows of arch segments can be a concern.
- Requires accounting for storage in the aggregate backfill voids



Picture 5: StormTech System Installation

Recommendations

Based on cost and product life span, StormTrap is recommended for the installation. The reduced footprint would minimize minimizing disturbance to the grounds and disruption to the community. This would also be particularly important with the space constraints at the Thornwood Park and Hibbard Park sites. Using a StormTrap product at all three parking locations, will also allow for more standardized maintenance procedures and a general familiarity with the StormTrap system by those responsible for future operation and maintenance.

B&W's previous experience with StormTrap is that they have one of the best product performance guarantees and product life spans on the market.

B&W is also recommending that the actual StormTrap product be specified in the bidding documents given the inter-governmental nature of this project and the sensitivity to the project constraints by the multiple stakeholders.

Table 1 – System Recommendation Matrix

Vendor	Normalized System Cost	Storage in Stone	Foot-print (ac.)	Typical Design Life	Maintenance
Contech	\$8,742,200	No	4.2	Moderate	Harder
StormTrap	\$9,808,700	No	3.5	Longer	Moderate
Welch Bros.	\$11,242,100	No	3.7	Longer	Moderate
GeoStorage	\$11,892,000	No	3.9	Moderate	Hardest
StormTech	\$13,772,400	Yes	5.4	Moderate	Hardest

Recommended Detention System – StormTrap

Recommended Secondary Option Detention System – Contech

Index of Attachments

- Attachment A – Storage Area Comparison Table
- Attachment B – Storage Cost Comparison Tables
- Attachment C – Vendor Supplied Information – StormTrap
- Attachment D – Vendor Supplied Information – Contech
- Attachment E – Vendor Supplied Information – Welch Bros.
- Attachment F – Vendor Supplied Information – GeoStorage
- Attachment G – Vendor Supplied Information – StormTech

Memo

To: Ms. Brigitte Berger-Raish, P.E.

Director of Public Works & Engineering

Village of Wilmette, Illinois

From: Matthew J. Moffitt, P.E., CFM, CPESC

**CC: Darren Olson, P.E., D.WRE, CFM, CPESC – Christopher B. Burke
Engineering, Ltd.**

Date: September 24, 2019

Project No.: 180564.40

Subject: StormTrap Pre-Purchase Recommendation for Community Playfields

BACKGROUND

Portions of the west side of the Village of Wilmette (Village) experience extensive surface flooding during large storm events. Underground stormwater storage was proposed as part of the West Side Neighborhood Storage Project (WSNSP) at three public parks: Community Playfield, Hibbard Park, and Thornwood Park.

Baxter & Woodman previously presented the “Underground Detention Systems Evaluation – Community Park” technical memorandum (memo), dated April 5, 2019, to the Village. The memo includes an assessment and comparison of five different underground detention vendors: StormTrap, Contech Engineering Solutions, LLC, Welch Bros., Inc., GeoStorage Corporation, and StormTech, a Division of Advanced Drainage Systems, Inc. The memo concludes with the recommendation to utilize StormTrap precast concrete vaults because of their reduced footprint, competitive cost, longevity, and historical local installation. Accordingly, the layouts presented in the Memorandum of Understanding (MOU) between the Village and Park District are based on the StormTrap footprints.

ADDITIONAL PRODUCTS CONSIDERED

Since the April 5, 2019 memorandum, two additional products have been considered. Questions regarding High Density Polyethylene (HDPE) pipe storage were presented by a resident. HDPE pipes were previously considered and determined not to be a viable option. Standard HDPE pipe sizes only go up to 60” diameter, and the Community Playfield location currently requires heights of 72” and 84” tall structures. Larger diameter pipes can be constructed, but they become significantly more expensive than the corrugated metal pipe alternative (according to Contech, who supplies both products). Additionally, the footprint for the HPDE pipe underground storage system would be

significantly larger than the StormTrap footprint. For these reasons, HDPE pipe storage is not recommended.

Oldcastle Infrastructure, a division of CRH out of Dublin, recently acquired a precast plant locally and is now in the Chicago market. The Oldcastle StormCapture system is a precast concrete vault system somewhat similar to StormTrap. The project team (Baxter & Woodman and Christopher B. Burke Engineering) has determined that StormCapture could be considered an “or equal” to StormTrap as they are both precast concrete vault facilities with similar load ratings, longevity, and footprint. However, as there have been no installation examples of StormCapture yet in the Chicago region, and therefore the product is not yet proven in this market. Additionally, there are concerns about the ability for Oldcastle Infrastructure to supply the amount of storage pieces in the tight timeline required for Community Playfields. For these reasons, the StormCapture system is not recommended.

RECOMMENDATION

The Community Playfields underground storage improvement is very large project, with a very tight timeframe for construction. Given this, the project team affirms the recommendation for StormTrap precast concrete vault system for their proven ability to supply the materials and local contractors’ experience installing the product. Examples of local municipal StormTrap installations include Village of Northbrook, Village of Glenview, City of Elmhurst, Village of Westmont, Chicago Department of Water Management, and many local School Districts and Park Districts.

The project team also recommends a pre-purchase of the product for the Community Playfields underground storage. We recommend the Village purchase the precast vault pieces from StormTrap directly; in 2019, ahead of award of the overall construction project to a general contractor. The project team believes that this will both save the village money, and help ensure the product is available in time for the aggressive construction schedule.

The traditional design-bid-build method has the following steps:

1. The Village issues the project out to bid;
2. A general contractor is awarded the project;
3. The general contractor places the order for the vault pieces (usually including a markup on the price);
4. The vendor (StormTrap) then begins production; and,
5. The vendor stores the pieces at their plant and delivers them to the site as needed.

Alternatively, a procurement pre-purchase would allow the Village to place an order directly with StormTrap and pay StormTrap directly. The pre-purchase order would include storage of produced materials by the vendor and delivery as needed, essentially cutting out steps 1-3 above for the purchase of the vault pieces.

Benefits to this option include:

- StormTrap receives the order and can begin production sooner, thus ensuring the product will be ready in time (approximately 2,200 precast pieces will be required).
- The Village has the opportunity to negotiate the price, terms and conditions with StormTrap directly, rather than having to accept whatever the general contractor presents. (Both Baxter & Woodman and Christopher B. Burke Engineering have worked with StormTrap multiple times throughout the previous years and are familiar with StormTrap's pricing and will assist the Village to verify competitive pricing)
- Pre-purchase eliminates a general contractor's ability to add a markup to the product (often in the 10% to 15% range – current vault estimate is approximately \$5,000,000).
- StormTrap implements their annual product cost increases at the beginning of 2020, thus a pre-purchase will allow the Village to lock in the 2019 rates.