

# StormStore: A feasibility study examining stormwater credit trading in the City of Chicago

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## ***Acknowledgements***

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The StormStore Project Team

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## ***Executive Summary***

### ***Exploring the Feasibility of Stormwater Credit Trading in the City of Chicago***

Across America, many communities face the adverse effects of stormwater management systems that cannot handle storm volumes. In the City of Chicago, modest rain and snow melt can overwhelm sewer systems, causing street flooding and basement back-ups. A single severe rainstorm in 2013 caused 2,500 “water in basement” and 800 “water on street” complaints, damages to businesses, and flooding at train stations and bus stops across the city. These effects, however, are disproportionately experienced in low-income or minority neighborhoods. There are also water quality consequences. Excessive stormwater volumes can cause combined sewer overflows, mixtures of stormwater and sewage with high levels of pollutants, which are released to Chicago’s river systems and Lake Michigan. People, aquatic life and industry from Lake Michigan to the Mississippi are all impacted. This problem is expected to worsen as climate change progresses and storms grow larger and more frequent.

The Metropolitan Planning Council (MPC) and The Nature Conservancy (TNC) estimated the impact of creating an offsite stormwater credit trading program in the City of Chicago for both rate and volume control. We propose this concept as an additional approach to stormwater management, recognizing that centrally managed, hard infrastructure alone is not enough to solve our stormwater problems.

Stormwater credit trading is an approach that provides flexibility to developers in meeting stormwater requirements while delivering detention capacity (rate control storage) and volume control storage (or retention capacity) in optimal locations for maximum benefit. Landowners or collaborating third parties install detention capacity or volume control at *supply sites*, receive certified credits for the delivered detention or volume control, and sell the credits to developers on *demand sites* that are eligible to meet their stormwater compliance obligations offsite. We refer to the potential marketplace where credits are bought and sold as StormStore™.

### ***Potential Benefits of StormStore™***

Rather than simply placing new stormwater infrastructure where real estate development is occurring, StormStore™ enables the intentional siting of equivalent infrastructure in priority areas, where the benefits are maximized *without* creating adverse impacts near development sites.

By harnessing market forces, StormStore™ can provide additional co-benefits including:

- Incentivize stormwater relief in flood-prone areas, especially Chicago’s South and West sides.
- Increase development density where it has wider benefits, such as adjacent to mass transit lines or in urban infill areas.
- Reuse of vacant land with local neighborhood benefits.
- Incentivize green and grey stormwater infrastructure at sites where it is most needed—with the potential to serve communities most vulnerable to the effects of urban flooding and other climate impacts. This can ease fiscal pressures on the City’s budget for stormwater management.
- Protect water quality, and provide habitat and green space that mitigate urban heat island effects.
- Bring investment dollars for stormwater controls in underinvested neighborhoods while also generating jobs.

## ***Enabling Stormwater Credit Trading***

StormStore™ operates under the premise that detention and volume control storage—both required since 2008 under the City of Chicago’s stormwater management regulations to be provided by real estate development and redevelopment sites—can be challenging for developers to meet on site in certain circumstances (e.g. soil conditions or space constraints). The required detention volume is the amount of water that must be held on a site and discharged at or below the release rate specified in the City’s Stormwater Ordinance to prevent flooding. The volume control storage is the total runoff generated by a ½ inch rainfall event over the impervious areas of a site which must be managed using green infrastructure practices (e.g. permeable pavement or bioretention).

By providing a cost-effective and transaction-friendly alternative whereby detention and/or volume control credits can be purchased from offsite locations via a central marketplace, developers are incentivized to proceed with a project they might otherwise have dismissed due to the onsite stormwater requirements. If these developments are then able to move forward, they can contribute to economic and community growth while also contributing to urban flooding mitigation where it is most needed.

## ***Positive Findings and Steps Forward***

This report summarizes (1) results of a stormwater and real estate model of potential demand for stormwater credits across Chicago, (2) a preliminary analysis of availability of supply sites, and (3) overarching policy considerations for StormStore™ in the City of Chicago context. The results of this analysis confirm that a stormwater market program can provide added value to development projects while transferring stormwater management capacity to areas within the sewershed group that have critical flooding problems and ample area to locate controls. This supports advancing the next phase of work to further analyze and determine how StormStore™ could function as a viable stormwater credit trading system in the City of Chicago.

## ***Is there enough demand?***

### *Summary of City of Chicago real estate demand analysis*

The real estate analysis was driven by this central question: to what extent would real estate developments in the City of Chicago benefit from a program allowing management of the stormwater detention or volume control to take place offsite? **The analysis found sufficient overall demand for an offsite option and significant economic benefits at the individual project level.**

Methods: The team developed a model based on permit data from 2016-2018 which was designed to:

- Project the potential demand for offsite solutions based on recent permit activity and the relative costs of undertaking stormwater controls on- and off-site;
- Quantify the potential net benefits in terms of financial savings and potential additional property value to property owners;
- Project the demand in terms of stormwater volume and land area for offsite solutions in each sewershed group; and
- Determine the positive or negative impact to property tax revenue by analyzing the change in Equalized Assessed Value, which is the measure of property value (land and building) assigned by the Cook County Assessor and multiplied by the State of Illinois’ equalization factor, which is

currently 2.9267. EAV's are used to determine the amount of property value that is taxed at the current property tax rate.

A total of 222 stormwater permits were analyzed that have cumulative approximate costs of \$90 million for on-site detention control and \$8.5 million for on-site volume control.

The model analyzed the potential for managing runoff offsite based on a range of variables including estimated costs of offsite land, benefits of increased building area measured by Floor Area Ratio (FAR), cost of offsite stormwater facilities, and threshold minimums in which property owners would choose an offsite solution. The model assumed:

- a 25% discount in land prices (e.g. some properties are made available at low cost due to non-profit or public ownership or tax delinquent properties),
- that 50% of projects would take advantage of increased FAR,
- A \$25,000 total economic benefit threshold that must be met or exceeded before developers would decide to purchase credits.
- \$16 cost per sq ft for offsite stormwater facilities.

Demand Findings: The analysis indicates that **43% of the 222 modeled projects would benefit from FAR increases and/or offsite stormwater benefits. If only half of these sites took advantage of a FAR increase is, the increase in land value is estimated to be \$35.4 million..** 41% of projects could benefit from credit trading, alone and independent of potential increases in FAR, providing an additional estimated \$8.2 million in cost savings as compared to building stormwater facilities on-site.

Geographic Distribution of Demand: Sites that would have benefited from offsite stormwater management were distributed throughout the City of Chicago. Of the 222 projects analyzed, the highest concentrations of projects benefitting from offsite stormwater facilities was on the **West Side of Chicago** (which includes the Near West Side and Near Northwest Side) with \$13.1 million in benefits and 122,000 sq ft of needed offsite land area. This is followed by the **South Side**, with \$9.9 million in benefits

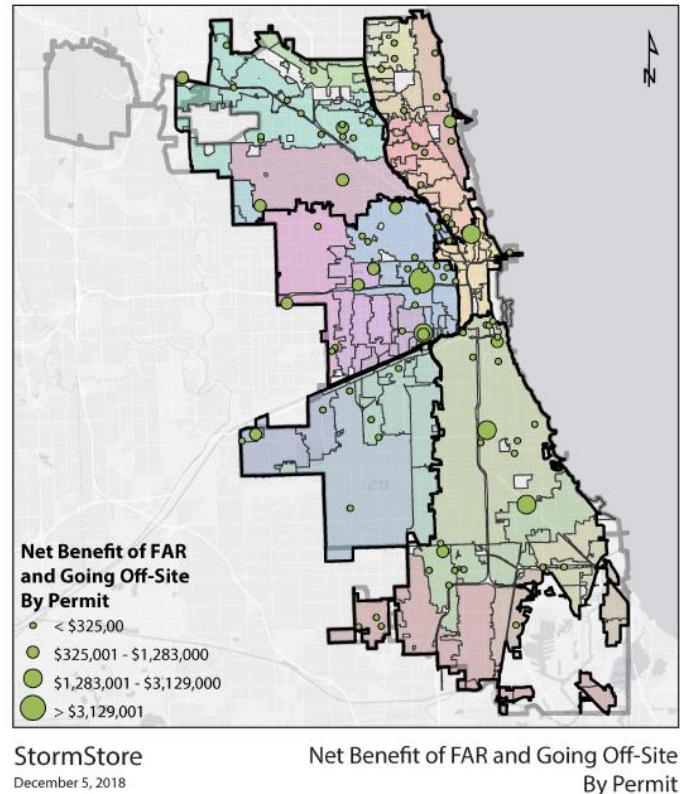


Figure 1. Net Benefit of FAR and Going Offsite By Permit; Courtesy: Teska; Hey & Associates, Inc.

and approximately 96,000 sq ft of needed offsite land area.

Offsite Area Required to Meet Demand: Based on the permits that were analyzed, the model predicts approximately 7.8 acres of land would be needed, distributed across all sewersheds.

Economic Benefit from Property Value and Taxes: **Total potential increase of real estate value, including tax exempt properties such as hospitals and schools, is approximately \$39 million, if stormwater trading predicted from the model had taken place.** The total increase in Equalized Assessed Value (EAV) of the 222 modeled sites is approximately \$10.6 million which accounts for an increase in assessed value due to additional FAR, net of any loss in assessed value at supply sites due to creation of new offsite storage. Additionally, an offsite stormwater program, **could assist with City of Chicago objectives to reutilize existing vacant land**, particularly land either owned by the City of Chicago and tax foreclosed properties, if such properties were used to meet offsite demand.

Based on the analysis, an offsite program can have a positive impact to EAV. While outside the scope of this study, the supply sites could also be constructed to create open space amenities that could help to stabilize the value of nearby properties based on studies in other cities.

Tax revenue and policy considerations relevant to a stormwater credit trading program may include:

- The ability to identify and utilize property that is currently tax exempt, such as schools, churches or parks. In these cases, there would be no loss of EAV to the City of Chicago and other taxing districts.
- The ability to identify and utilize property that has foreclosed on taxes and can be acquired through the Cook County Land Bank.
- The ability for developers to build-out additional FAR that results from moving from onsite surface detention solutions to offsite solutions.

This model demonstrates:

- There are significant financial benefits of a stormwater credit trading program in the City of Chicago
- The total benefits of additional Floor Area Ratio (FAR) outweigh the costs of acquiring land and constructing stormwater facilities
- Even without increases in FAR, there are significant net benefits to managing stormwater offsite for many permits
- There is no projected net loss in Equalized Assessed Value (EAV); increases in EAV onsite are greater than any loss to EAV from converting land to stormwater use
- There is a large projected increase in real estate value (\$39 million), accounting for the inclusion of participating tax exempt properties such as hospitals and schools.

## ***Is there enough supply?***

### *Summary of supply analysis for the City of Chicago*

The objective of the supply analysis was to identify potential example sites that could provide stormwater detention and/or volume control in the City of Chicago, focusing on land uses with favorable characteristics within a selected area, “sewershed group N”. (Based on discussions with City staff, we focused on sewershed groups as the appropriate geographic area within which stormwater trading could occur.) Sewershed group N is located immediately west of downtown—which has the Kennedy and Dan Ryan expressways as its eastern border and extends west (roughly) to Garfield Park, north to Fullerton, and south to the South Branch of the Chicago River. This area encompasses several neighborhoods which are experiencing among the highest development pressures in the city. **The analysis found that a variety of potential typologies exist which could be redeveloped for the purpose of generating stormwater credits.**

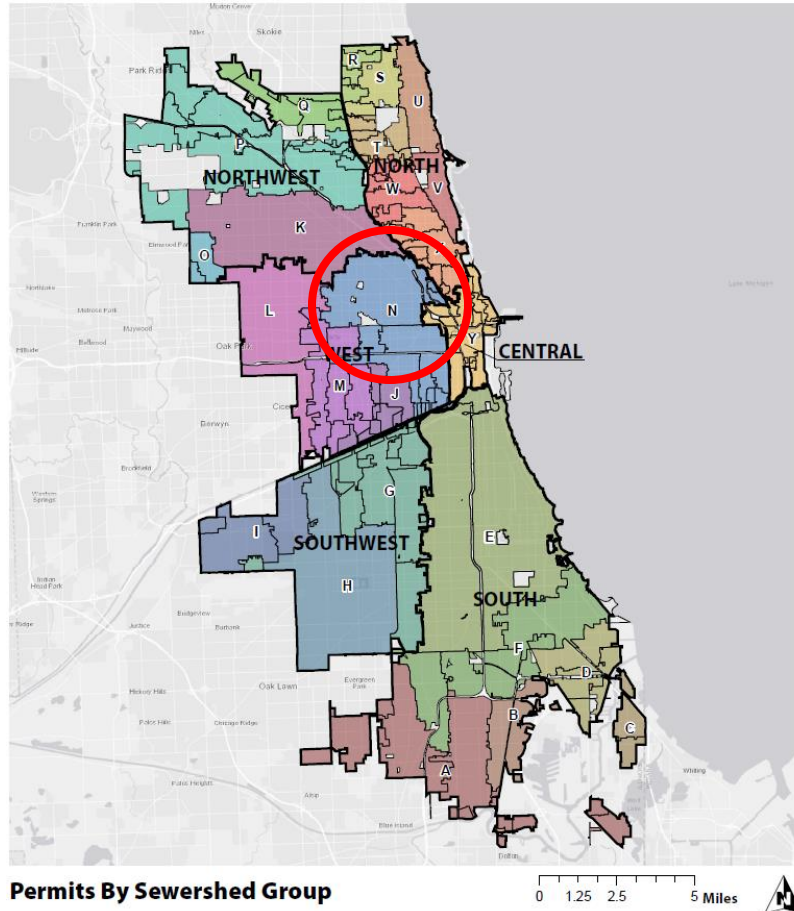


Figure 2. Sewersheds (narrow black borders), sewershed groups (labeled by letters) and sewershed regions (bold black borders with names, e.g. SOUTH). Courtesy: Teska; Hey & Associates, Inc.

Note: the Sewershed Group N analyzed in this study is circled in red.

Methods: Using geographic information system (GIS) mapping tools, a Land Use shapefile for northeastern Illinois was overlaid onto a LiDAR image file of existing Land Cover in Cook County to identify parcels in sewershed groups N with favorable characteristics to generate stormwater credits. Sewershed group N is an area of the city where development pressures are likely to trigger a demand for a stormwater credits. Parcels (or groups of parcels) were arranged according to land use and then sorted by acreage.

Land uses with adequate parcel sizes were then assessed to determine whether they had available space which could be redeveloped to generate stormwater credits. Note that, although this redevelopment would currently trigger the city’s stormwater management ordinance and require the property owner to comply with detention or volume control requirements, this analysis assumes that the ordinance would be revised to include provisions related to stormwater credit trading.

Overall Supply Findings for Sewershed Group N: At the outset of this analysis, it was assumed that Vacant Commercial land would be a logical land use on which to generate stormwater credits. A cursory look at sewershed group E, which covers a large portion of Chicago’s south side, indicates that Vacant



Commercial land uses would likely be one of the major typologies for providing credits in that sewershed. Sewershed group N was selected for this analysis, however, as a “worst case scenario”. Because of the high development pressures being experienced there, the majority of vacant land has become redeveloped as commercial or mixed-use developments. Nevertheless, even in this sewershed group where Vacant Commercial land is limited, the analysis found that a variety of potential typologies exist which could be redeveloped for the purpose of generating stormwater credits.

Among the land uses assessed, several exhibited characteristics favorable to the construction of stormwater controls and generation of credits. **A variety of Institutional land uses were identified as the most favorable typologies in sewershed group N, specifically Medical Facilities, K-12 Educational Facilities, Post-Secondary Educational Facilities, and Religious Facilities.** For example, although “Medical Facilities” within the Illinois Medical District tend to develop the majority of the parcel with impermeable surfaces, smaller facilities such as Norwegian American Hospital (8.89 acres total, 6.76 in surface parking) have an abundance of surface parking (see Fig. 3) and some open/green space which have the potential to be retrofitted with underground storage, bioswales, or other permeable surfaces.

**Open Space, Primarily Recreation is another land use type which could be a supplier of stormwater credits.** All of the large “Open Space, Primarily Recreation” parcels in sewershed group N are either owned by the Chicago Park District or are linear parks along the Chicago Boulevard System. Examples include Union Park (14.27 acres), Sacramento Boulevard (linear park running south from Humboldt Park; 9.37 acres), Smith Park (8.12 acres), Arrigo Park (6.05 acres), and Mark Skinner Park (5.74 acres). If willing, the Chicago Park District could become a major supplier of stormwater credits.

Finally, **some groupings of Vacant Commercial land were identified which could be a source of stormwater credit generation.** However, this typology would generally require a developer to acquire multiple parcels (i.e., administratively onerous) and would result in relatively small groupings of land—usually less than one acre—on which to develop stormwater detention and/or volume control infrastructure. Therefore, this land use is unlikely to be a primary source of stormwater credits in sewershed group N. It is assumed that city officials would find this outcome preferable since it would leave this land available for commercial redevelopment and, thus, able to generate tax revenue.



*Figure 3. Norwegian American Hospital – typology for supply site.  
Note: the blue boxes have the same “Institutional, Medical Facilities” land use code and are presumed to be owned by Norwegian American Hospital.*

Next Steps: This analysis does not attempt to answer questions related to feasibility, such as parcel ownership and the owners’ willingness to generate and sell stormwater credits. Rather, it focuses solely on potential land use typologies and their availability in an area of the city experiencing high development pressures. To determine the feasibility of generating stormwater credits on these types of sites, property owners of the identified typologies—universities, Chicago Park District, Chicago Public Schools (and other schools), medical institutions, etc.—must be contacted about potential interest and ability to generate and sell stormwater credits.

Additionally, a suite of sites should be selected to develop *pro formas* to determine the type of stormwater detention and/or volume control measures suitable to various sites, the cost to design, construct and maintain such projects, and appropriate credit sale prices that would incentivize property owners to develop projects.

These results are applicable to sewershed group N. Using the land uses identified as having favorable characteristics for developing stormwater credits, the analysis should be replicated in sewershed groups E (a large section of the South Side) and X (north of downtown), which are also experiencing high development pressures.

## ***What are the policy considerations for a potential stormwater credit trading or other program in the City of Chicago?***

### *Summary of policy analysis*

There are a number of key opportunities for policy modifications to create an equitable stormwater credit system. These were identified through StormStore™ analysis of policies in Cook County (outside the City of Chicago), examination of the credit trading program in Washington D.C., and conversations with City of Chicago staff during 2018. The following highlights key policy considerations that merit further investigation to inform StormStore™ options in the City of Chicago.

### *Enabling Offsite and Trading through the Stormwater Ordinance*

Currently, the City of Chicago's Stormwater Management Ordinance requires real estate developments to manage stormwater onsite for both detention and volume control. The City ordinance includes provisions for alternative approaches to reducing runoff, vs. capturing and retaining 0.5" of runoff.

For many development projects, both detention and volume control practices can be incorporated into the site design of a project or redevelopment. However, in many instances it can be challenging for developers to meet these requirements onsite. In other situations current capacity to handle stormwater may be sufficient and therefore additional stormwater control may not be essential, and requiring onsite stormwater controls based on the ordinance would be less beneficial than in other locations with greater stormwater problems. In these situations it may be more beneficial to allow for developments to purchase credits representing stormwater management capacity provided elsewhere

To allow developers to meet their stormwater obligations by purchasing credits from an offsite supplier, the City's Stormwater Management Ordinance would need to be modified to offer the option of purchasing credits from an offsite supplier. If the Stormwater Management Ordinance were to be updated it would be important to establish requirements that would accommodate trading while also avoiding adverse unintended outcomes related to environmental impacts or social equity. These issues can be addressed by, among other strategies, establishing rules for the geographic boundaries of credit trading and identifying priority areas for supply sites. . The City would also have the opportunity to define its role in overseeing or participating in the market.

### *Policy Considerations – Supporting a Fee In-Lieu Program*

A further option that would complement a stormwater credit trading program is a fee in-lieu system. This allows developers to pay fees to the City rather than build stormwater controls onsite. The fee generally reflects the cost that the City would incur to implement public stormwater projects and is generally higher than the cost to deliver similar controls on private land. Fee in-lieu programs create an upper ceiling on credit price and are a fallback for developers who wish to manage runoff offsite in the event that credits are unavailable. The City would use the collected fees to implement local stormwater projects. Many municipalities across the country implement a fee-in-lieu option, and this approach is also employed in some other environmental markets, including the Washington D.C. stormwater retention market.

This option could function in a manner somewhat similar to the City of Chicago's existing Neighborhood Opportunity Fund program or the Open Space Impact Fee program, where fees or charges are paid by

developers in certain geographies and the funds are then used for stormwater investments in disadvantaged areas of the city that are flood-prone and underserved by the real estate market.

Aspects to further investigate for properly establishing a fee in-lieu program include:

- Establishing a fee structure and any waivers to incorporate into the program
- Establishing an account or fund where fees would be accumulated
- Identifying areas where stormwater investments would be prioritized and paid for by the program

### *Policy Consideration – Creating a Credit Purchase Guarantee Program*

The City may consider establishing a credit price floor by creating a purchase guarantee program. Such program will provide set-aside funding to purchase unsold credits at a price that is lower than the expected market rate in order to incentivize and provide assurance to credit suppliers considering participation in the market.

An example of an existing credit purchase guarantee program (the SRC Price Lock Program), was created to support the credit trading program in Washington D.C.. There, the Department of Energy and Environment has set aside \$11,500,000 as an initial commitment to purchase unsold credits through the Price Lock Program. Applications are on a rolling basis and accepted so long as funds are available and other restrictions are met.

### *Policy Considerations – Direct Incentive Programs*

Direct incentive programs are another option that could accelerate the delivery of stormwater management projects throughout the city, and could work on their own or in conjunction with a stormwater credit market. Incentive programs take many forms, and can provide either full or partial cost recovery to private property owners who pay for the installation of stormwater controls on their land. The cost of the controls would be covered in-part or in-full by the City. This program could be beneficial to the government because it has the potential to leverage private funds for project delivery. . The City of Chicago already has a similar model with its Shared Cost Sidewalk Program.

However, this option requires further investigation to ensure that the local government has a sustainable revenue stream from which to provide the discounts and cover the remaining maintenance costs. In many cities where direct incentive programs function well, stormwater fees are collected to support those programs. In addition, this approach would need to consider social equity, as it *could* unintentionally be utilized more frequently in wealthier communities where private landowners have the ability to pay for their portion of the infrastructure investments up front as compared to lower-income communities.

## ***Summary and Next Steps***

In summary, there are a number of potential benefits of stormwater credit trading program that were identified in this study. Benefits to the community include the redistribution of stormwater assets to make new development and new stormwater infrastructure more efficient, more effective, and more equitable. A developer may benefit economically by saving on the cost to construct stormwater management facilities and/or by increasing the value of the development through FAR increases.

Additionally, credit trading can result in the delivery of stormwater management capacity where it is most needed in terms of creating attractive open spaces and community amenities and addressing street flooding or basement backups..

The StormStore™ project team has determined that **sufficient potential credit demand and supply and existing policy frameworks merit further investigation of the concepts, policies, and details** needed for successfully establishing a stormwater credit trading market for the City of Chicago.

The project team has identified the following next steps to be undertaken as part of StormStore™ Phase II:

- Conduct further stakeholder outreach and investigate market-enabling policy development.
- Execute collaborative workshops to explore and understand market structure, administrative and regulatory options, online platform development, trading rules and regulations.
- Model investment potential via pro forma finance models for StormStore in the City of Chicago.
- Pilot stormwater credit trades in the City of Chicago to further refine market structure and other considerations.

## ***Appendix – Hypothetical Trading Scenario***

### **Potential Demand-Side Participant - Industrial**

**Land use:** Representative industrial development that includes a parking lot, loading dock, building and open space used to provide surface detention.

**Stormwater:** Rate control storage requirements met using a surface detention basin north of the building. At an estimated cost of \$4.50 per cubic foot, it is estimated that the 149,311 cu. ft. storage facility construction cost is \$670,000. The development reduces site imperviousness by 19%, so volume control storage is not required.

**Potential Offsite Detention Demand:** Offsite storage allows a larger building and more value to the site. Land is valued at \$2.18 per sq. ft. in this area. With an average cost of \$4.50 per cu. ft. and a land requirement of 0.33 sq. ft. per cu. ft., an offsite detention facility could potentially be constructed for \$780,000 ( $(\$4.50/\text{cu. ft.} \times 149311 \text{ cu. ft.}) + (\$2.18/\text{sq. ft.} \times 149311 \text{ cu. ft.} \times 0.33 \text{ sq. ft./cu. ft.})$ ).

The building could be increased by up to 22,650 sq. ft. and still meet the 15% impervious surface reduction to satisfy volume control requirements. At \$72/sq. ft., this generates \$1,630,800 of additional building value.

The potential value created by offsite detention is \$1,520,800 (\$670,000 onsite construction savings + \$1,630,800 added value - \$780,000 offsite construction cost). These costs include construction and normal engineering fees, but do not account for increased administration, permitting, delays, or any other complexities associated with implementing offsite detention.

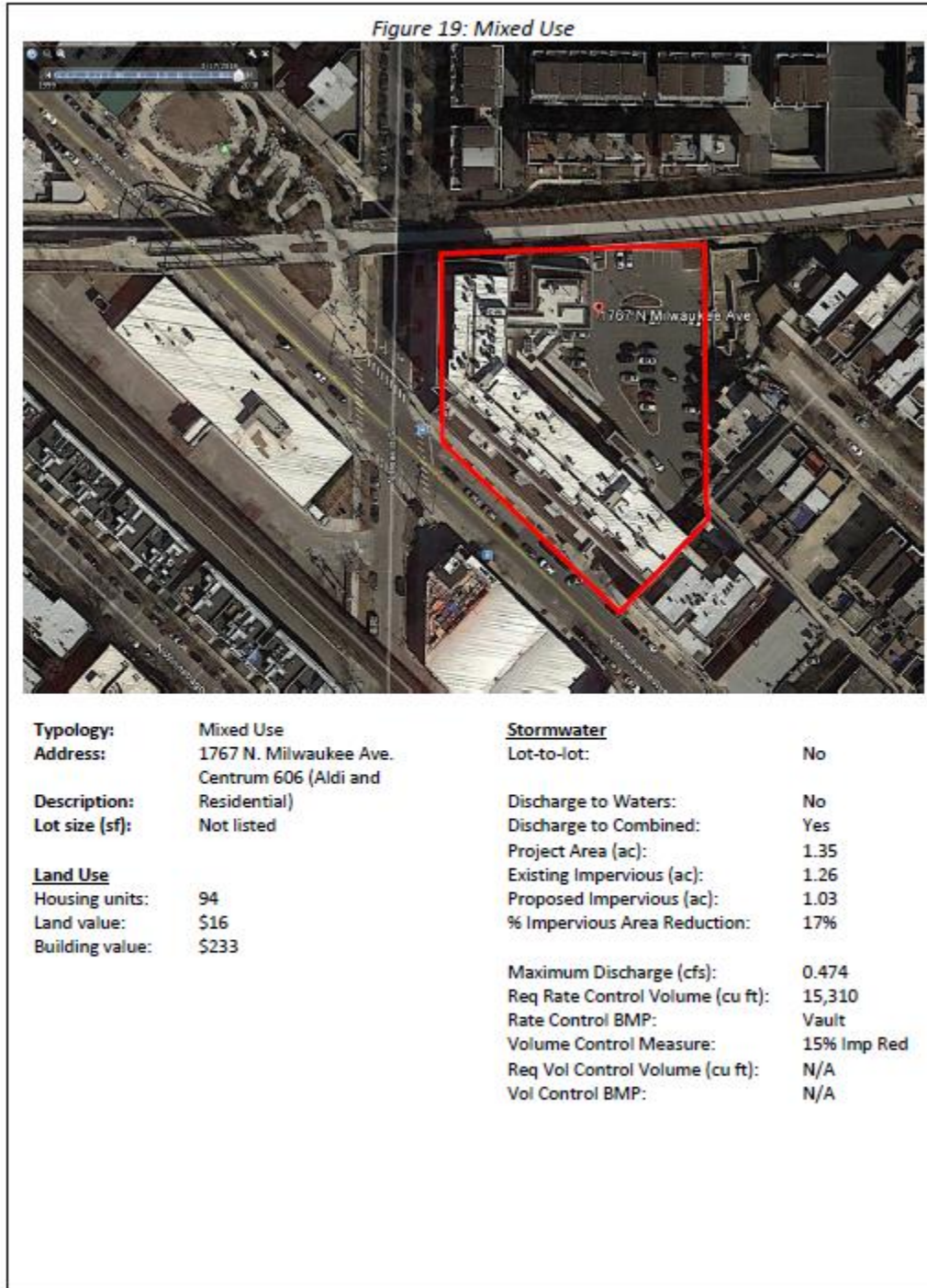


Figure 4. Potential Demand-Side Participant - Industrial; Courtesy: Teska; Hey & Associates, Inc.

## Potential Supply-Side Participant

Near the industrial development site, there is a ½ acre vacant parcel owned by a land bank or the City of Chicago. There is no demand for the reuse of this parcel due to its location. The parcel is an eye sore to the community and offers very little stormwater storage or other environmental benefits.

**The opportunity:** The existing site can be retrofitted with a detention basin with trees and vegetation, and native planting to support butterfly habitat. The owner can then sell the stormwater storage capacity into the market. Initial installation is the main cost, assuming there is no land acquisition cost to the land



bank or the City who already owns the land. This is an opportunity to turn a vacant lot into a revenue generating project for the land bank or City while becoming a park-like amenity for the community that provides other environmental co-benefits to address biodiversity and urban heat island effect. The supply site can be retrofitted to provide the required detention amount at a cost significantly lower than the surface detention basin that would otherwise be

*Figure 5. Potential Supply-Side Participant – Vacant City-owned Land; Courtesy: MPC*

built at the buyers property.