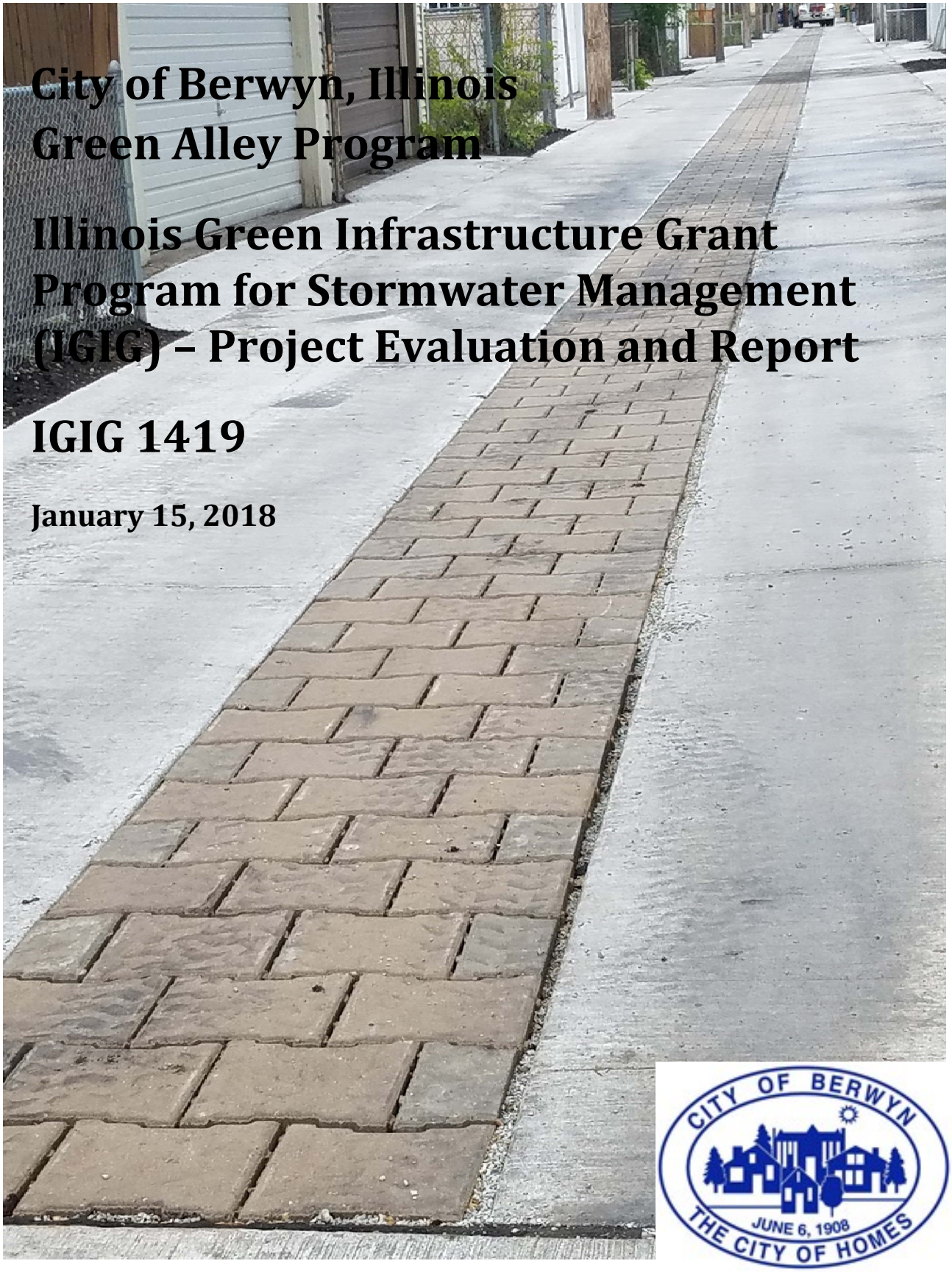

City of Berwyn, Illinois
Green Alley Program

Illinois Green Infrastructure Grant Program for Stormwater Management (IGIG) – Project Evaluation and Report

IGIG 1419

January 15, 2018

City of Berwyn, Illinois
Green Alleys Program
IGIG

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SUMMARY

The City of Berwyn is located within ten miles of the Chicago Loop, situated between the Stevenson (I-55) and Eisenhower (I-290) Expressways and is in close proximity to Midway Airport, O'Hare Airport and served by the Metra Rail line. Due to its prime location and availability of affordable housing, the City has seen an increase in population, traffic and urban density over the past several decades.

The City's land area is 3.9 square miles with a growing population of 56,657 in which 72% are over the age of 18. This equates to a population density of 14,527 per square mile; 20% higher than that of Chicago's.

The City's combined sewer system is nearing 100 years old and incapable, at times, of handling the increased capacity especially during a storm. Much of the combined sewer system was designed to handle small one-story structures when pervious green areas were much larger. While the population and density of Berwyn has grown, the combined sewer system has remained largely untouched. Currently the City contains only 2.0% of open space. The City's current stormwater management system is a combined sewer system provided by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), comprised of a conveyance system nearly 100 miles in length and storm laterals totaling 19 miles. Stormwater runoff and sewage are collected into a single pipe and ultimately discharged into the large interceptors of the MWRDGC where it is eventually treated at their Stickney Treatment Plant.

The City has experienced several instances of damaging flooding over the past couple of years. The City's combined sewers are outdated and were not originally designed to sustain the demands of a growing urban area. The Green Alley Program is intended to provide storm sewer relief to the City's combined sewer system by providing detention and percolation areas in the alleys. The City is looking to redevelop these areas using a green pavement solution as a way to mitigate flooding concerns as well as prepare for the future. Over the past couple of years, the City has experienced severe flooding events resulting in hundreds of thousands of dollars in damage and the displacement of residents from their homes.

Through the Green Alleys Program, surface runoff entering the green alleys will infiltrate the ground rather than end up in the combined sewer system. This initiative will also reduce pollutant loads entering both the City system and the MWRDGC system and will ultimately reduce the discharging of pollutants into the area waterways, improving local water quality in the long term.

Originally, the Berwyn Stormwater Project (1419) consisted of three projects: the construction of eight (8) green alleys, streetscape improvements in the downtown Depot District, and a downspout disconnection program.

The Depot District project proposed the reconstruction of parking areas to provide stormwater infiltration benefits; rebuilding of sidewalks with Silva Cell technology that allows the tree roots to grow, reduce pollutant loads from the stormwater runoff, and provide stormwater infiltration; and the reconstruction of pervious areas within islands and parkways to provide bioswales and natural landscaping. The anticipated outcomes are listed below:

- Provide 54,900 cf of stormwater storage under permeable pavers, Silva Cells, and bioswale and landscaped areas. (30% reduction in runoff within the 10 block project area).
- Reduce annual pollutant loads by the following amounts:
    - 1.82 lbs/yr
    - lbs/yr
    - 0.96 tons/yr

The Depot Streetscape Project was delayed due to an advanced utility project within the same area and did not move forward within the time period listed in the Intergovernmental Agreement (IGA).

The downspout disconnection program, which is covered in more detail under a separate report, was to provide residents with financial assistance with the disconnection of the gutter downspout from the home's sewer service line. The initial goal was to assist 500 homeowners with the program. 1,013 households showed interest in the program, in which upon final inspection a total of 668 homes have disconnected their downspouts. Although, residents used the City's do-it-yourself handouts for downspout disconnection, they did not take full advantage of the reimbursement.

The outstanding funding from the Depot District project and downspout disconnection program were transferred to the Green Alley program. The City initially requested funding for the construction of eight (8) green alleys, but have designed eighteen (18) alleys for "shovel ready" status for future grant opportunities.

Introduction

As previously stated the original Green Alley program consisted of eight (8) alleys composed of 19,800 square feet of porous pavement between a border of normal concrete (56,520 square feet).

The City of Berwyn utilized IGIG funds with MWRD Green infrastructure funds to initiate and expand upon the Green Alley Program to reconstruct fifteen (15) concrete alleys totaling 17,390 square yards. The proposed green alley will have an alley section that is sloped to a center section composed of pervious concrete above an aggregate base. Garage aprons and sidewalks intersecting the proposed green alley were sloped so that run-off was directed towards the center paver section.

See the Appendix for existing and proposed typical sections.

A location map is included in the Appendix for reference. The locations are as follows:
1. 1300 block - Oak Park to Euclid Avenues
2. 1400 block - Highland to Harvey Avenues
3. 1900 block – Harvey to Lombard Avenues
4. 2600 block – Kenilworth to Grove Avenues
5. 3000 block – Kenilworth to Oak Park Avenues
6. 3100 block – Elmwood to Ridgeland Avenues
7. 3700 block – Grove to Oak Park Avenues
8. 3800 block – Grove to Oak Park Avenues
9. 3700 block – Cuyler to Highland Avenues
10. 3700 block – Highland to Harvey Avenues
11. 3400 block – Kenilworth to Grove Avenues
12. 3800 block – Wenonah to Wisconsin Avenues
13. 7000 block – 26th Place to 26th Parkway
14. 2900 block – Maple to Harlem Avenues
15. 2800 block – Maple to Harlem Avenues

The proposed green alley locations are used heavily by residents who live in the adjacent homes wishing to access their garages. The project area lies within a heavily developed residential area where over 70% of the land surface is impervious. The impervious surface of the alley pavement allows stormwater to enter the combined sewer system or floods residents' property.

Permeable Pavers is a highly effective on-site stormwater management practice and considered amongst the Best Management Practices (BMPs) of the EPA. Berwyn is hopeful that the Green Alley Program will reduce the volume of stormwater entering the combined sewer system by 97%. Surface runoff entering the green alleys will infiltrate the ground rather than end up in the combined sewer system. This initiative will also reduce pollutant loads entering both the City system and the MWRD system and will ultimately reduce the discharging of pollutants into the area waterways. Thus, the Green Alley Program will help improve local water quality in the long term.

Des Plaines River

Not Supporting Use	**Cause**	**Source**
Aquatic Life Fish Consumption Primary Contact	Aldrin, Arsenic, Chloride, Lindane, Mercury, Methoxychlor, Flow regime alternations, Polychlorinated biphenyls, Fecal Coliform, pH, Phosphorus (Total)	Atmospheric Deposition – Toxics, Combined Sewer Overflows, Contaminated Sediments, Impacts from Hydrostructure Flow Regulation/modification, Municipal Point Source Discharges, Unknown, Dam or Impoundment, Urban

Chicago Sanitary and Ship Canal

Not Supporting Use	Cause	Source
Fish Consumption Indigenous Aquatic Life	Iron, Oil and Grease, Oxygen – Dissolved, Polychlorinated biphenyls, Phosphorus (Total)	Combined Sewer Overflows, Impacts from Hydrostructure Flow Regulation/modification, Municipal Point Source Discharges, Unknown, Urban Runoff/Storm Sewers

The chart above indicates the number of pollutants in the surrounding waters that can be attributed to CSOs and stormwater runoff. The capacity of the existing system is exceeded during heavy rainfall and has been the case of flooding within the City. The City wishes to pursue future projects to aid in stormwater management.

The City of Berwyn is located within the Des Plaines River watershed. This watershed covers over 850,000 acres of predominately urban and industrial uses within Lake, DuPage, Cook and Will Counties. The Illinois EPA found that only 24% of the watershed was in "good" condition. The EPA went on to attribute the primary cause of problematic conditions to municipal point source pollution and urban runoff. Berwyn is located near a segment of the Des Plaines River identified as a Section 303(d) impaired water body for which sources of impairment include CSOs and urban stormwater runoff.

The City of Berwyn maintains 54 miles of alley pavement. Converting impervious alleys to green alleys throughout the City will have a large impact in maintaining the City's stormwater as the City continues with this project. Since the City is primarily an urban built-out neighborhood, it looks to ways of converting impervious areas to pervious.

The Illinois Environmental Protection Agency provided funding assistance for the project through the Illinois Green Infrastructure Grant Program for Stormwater Management. A permit for construction of the project was obtained from the MWRD.

Construction for the green alleys started in March of 2016 and were substantially completed on December 22, 2017 with only minor punchlist items to complete.

Discussion

Alleys citywide identified to be in poor pavement condition are cored for pavement and soil composition to analyze the reason for pavement failure. After review of the pavement and soil samples, it was determined that the fifteen (15) alleys included in this report have viable soil conditions to be designated as green alleys. The soil conditions will allow for water collected on the surface to infiltrate through the ground instead of inundating the combined sewer system. The existing alley pavement was removed with any required excavation necessary to build the green alley section. The green alley section consists of an inverted "v" section with concrete pavement and a center permeable paver strip. The water directed to the paver strip will infiltrate through layers of gravel until absorbed by the ground. This section is used where sandy soils have been identified.

A total of 28,215 square feet of permeable pavers between a border of concrete have been constructed. The permeable pavers were constructed over fourteen (14) inches of open-graded stone that serves as the structural base as well as temporary storage of run-off before it infiltrates into the sub-grade.

The BMP is designed to filter runoff to remove suspended sediment, heavy metals, oil and grease, nutrients, and other suspended and soluble nonpoint source pollutants as well as reduce runoff volume and velocity while providing other beneficial hydrological functions.

The green alleys are capable of detaining 867,172 gallons of stormwater per rain event.

	Pre-BMP Loading (lbs/yr)		Post-BMP Loading (lbs/yr)		Load Reduction (lbs/yr)
BOD	209		U		U
COD	1,330		266		1,064
TSS	2,936		294		2,642
LEAD	2		0		2
COPPER	0		U		U
ZINC	9		0		9
TDS	4,142		U		U
TN	57		9		48
TKN	30		U		U
DP	2		U		U
TP	8		3		5
CADMIUM	0		U		U

U = Removal Efficiency for the particular BMP and constituent unavailable.

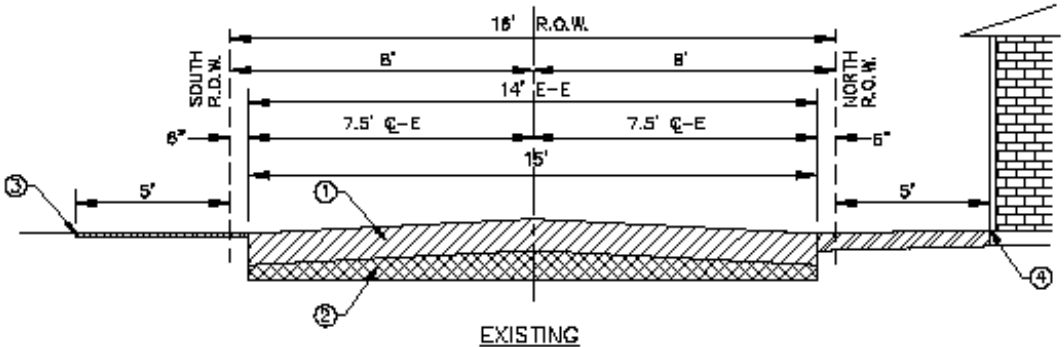
Project Costs

Agency	Total
Illinois EPA	$2,224,136.55
MWRD	$666,700.00
City of Berwyn	$336,485.45
Total Project Cost	$3,227,322.00

The Green Alley Program demonstrates the value of sustainable infrastructure using permeable pavers. In a densely urban area with more than 80 percent impervious surface, removing impervious surface and replacing with permeable pavers greatly enhances the opportunity for infiltration of stormwater runoff into the ground and reduction of stormwater volume to the combined sewer.

Appendix

1. Typical Sections



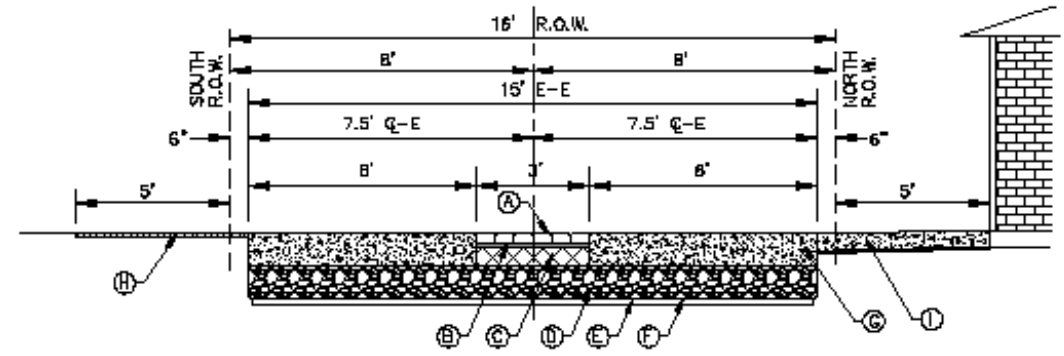
EXISTING

① EXISTING ALLEY PAVEMENT TO BE REMOVED

② EXCAVATE EXISTING SOIL TO A DEPTH TO ACCOMODATE PROPOSED RETENTION STORAGE

③ EXISTING HMA PAVEMENT TO BE SAWCUT AS DIRECTED OR TO A MAXIMUM DISTANCE OF 5' FROM RIGHT OF WAY LINE AND REMOVED

④ EXISTING P.C. CONCRETE SIDEWALK OR P.C. CONCRETE DRIVEWAY PAVEMENT TO BE SAWCUT AS DIRECTED OR TO A MAXIMUM DISTANCE OF 5' FROM RIGHT OF WAY LINE AND REMOVED



PROPOSED

Ⓐ PROPOSED PERMEABLE PAVERS (3-1/8" THICK)

Ⓑ PROPOSED CHIP GRAVEL (CA-16) 1-1/2"

Ⓒ PROPOSED AGGREGATE BASE COURSE, TYPE A (CA-7), 3-3/8"

Ⓓ PROPOSED AGGREGATE BASE COURSE, TYPE A (CA-1), 12"

Ⓔ GEOTEXTILE FABRIC

Ⓕ TENSAR GEOGRID

Ⓖ PROPOSED P.C. CEMENT CONCRETE PAVEMENT, 8"

Ⓗ PROPOSED INCIDENTAL HMA SURFACING, 3" AS DIRECTED OR TO A MAXIMUM DISTANCE OF 5' FROM RIGHT OF WAY LINE

Ⓘ PROPOSED P.C. CONCRETE SIDEWALK, 5" OR P.C. CONCRETE DRIVEWAY PAVEMENT, 7" AS DIRECTED OR TO A MAXIMUM DISTANCE OF 5' FROM RIGHT OF WAY LINE

TYPICAL CROSS SECTION

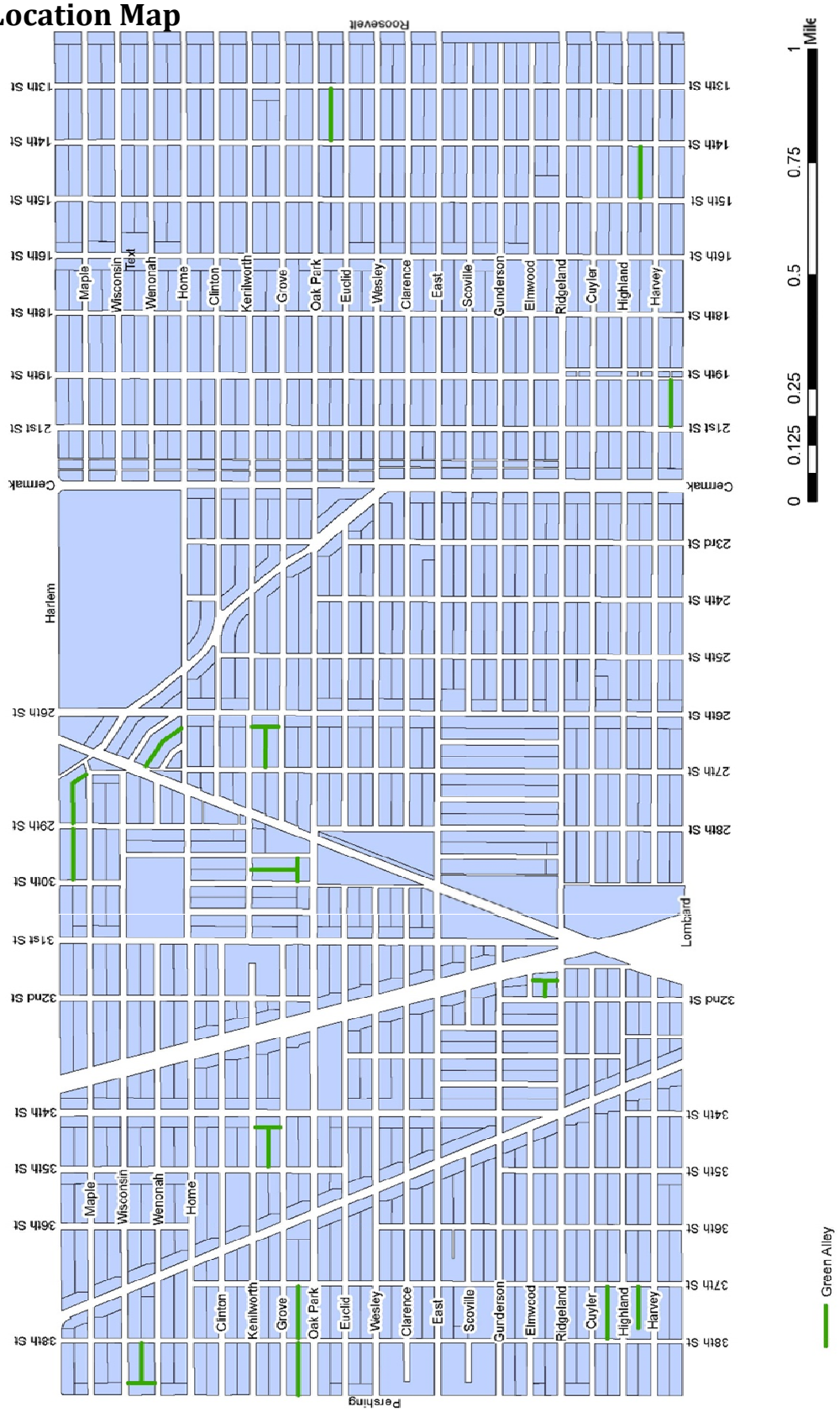
Frank Novotny & Associates, Inc.

PROJECT

CITY OF BERWYN, ILLINOIS
GREEN ALLEY PROGRAM
ATTACHMENT B

PROJECT NO. 15110

2. Location Map



3. Project Photos

Figure 3.1 – Existing Conditions

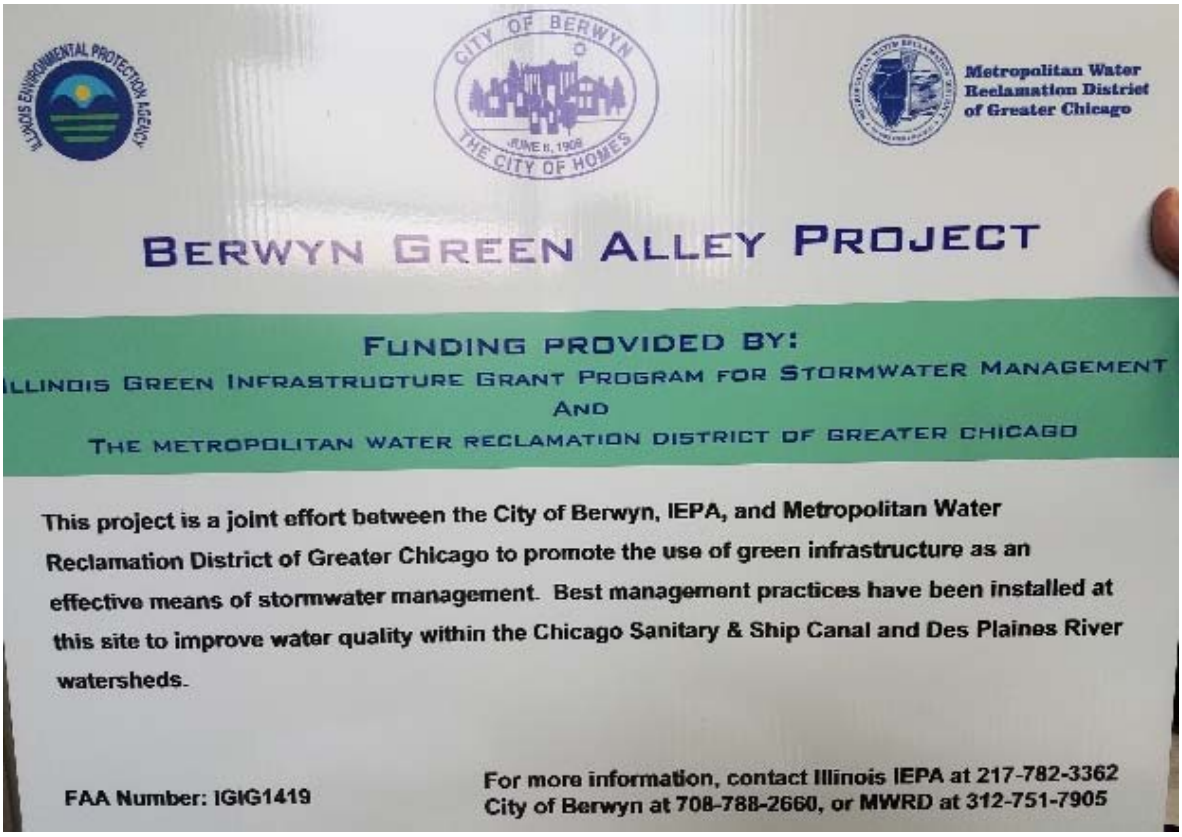


Figure 3.2 - Project Information Sign

Figure 3.3 - Pavement Removal

Figure 3.4 – Aggregate Base Course with Geotextile Fabric

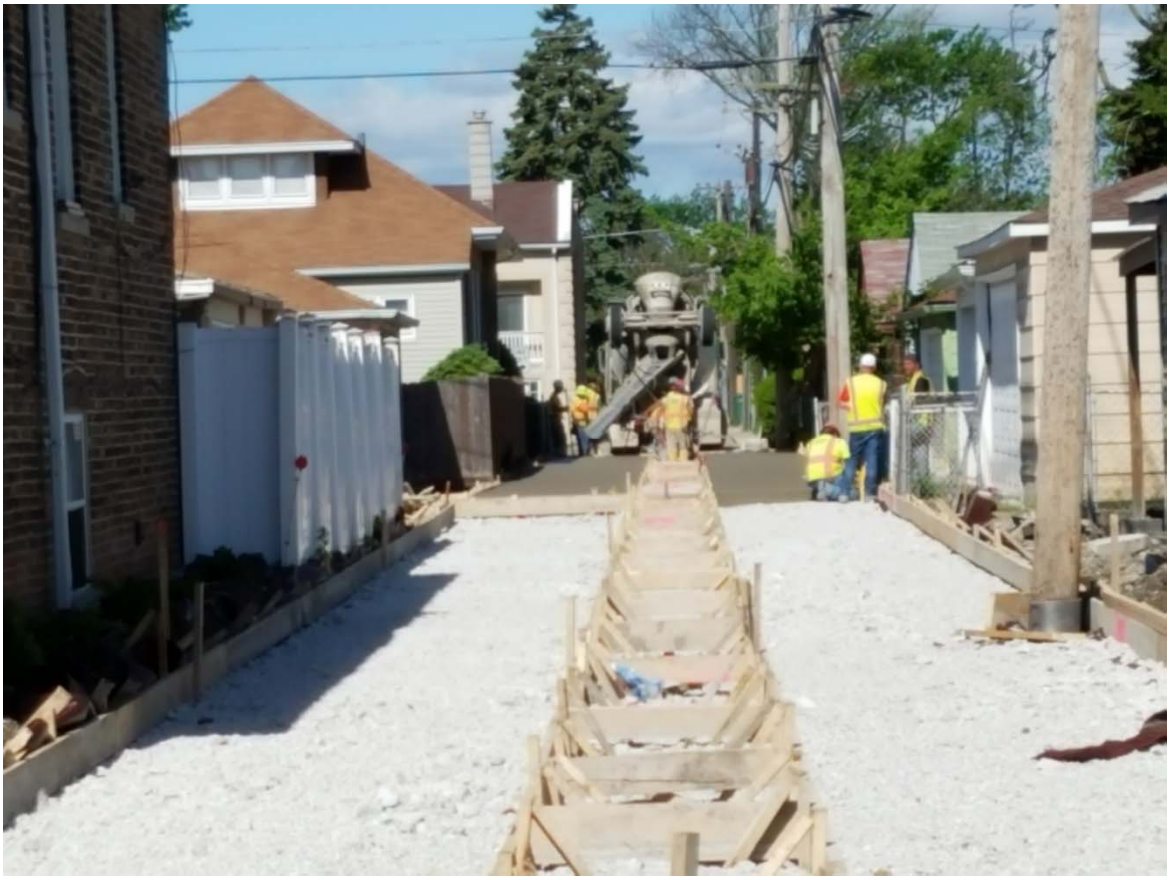


Figure 3.5 – Concrete Placement

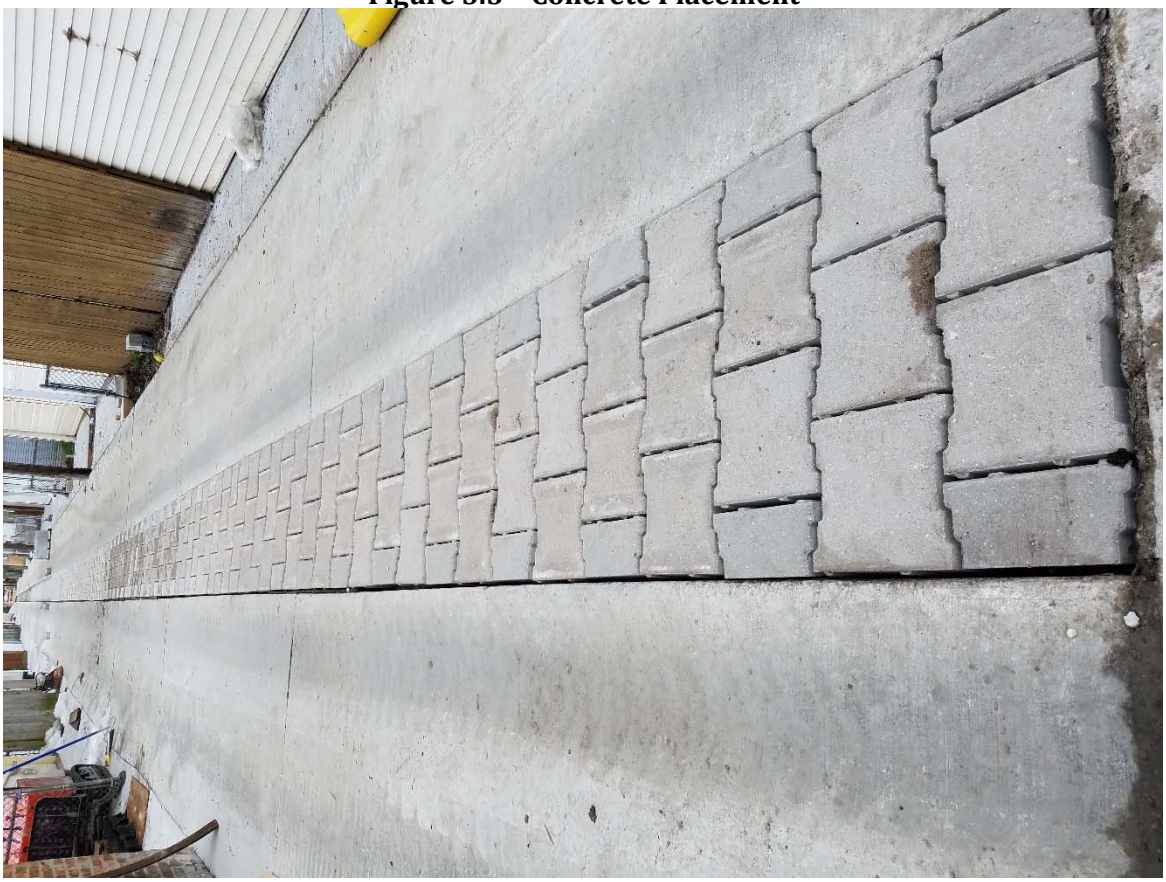


Figure 3.6 – Completed Alley