Big Creek Watershed Stormwater Retrofit Implementation Project

Final Technical Report

Lake Erie Protection Fund SG 456-2013

Big Creek Connects

(formerly Friends of Big Creek)

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ABSTRACT

This *Implementation* Project was developed as the second phase of the Big Creek Watershed Stormwater Retrofit *Ranking* Project completed in 2013. Big Creek Connects (BCC) initiated the project to better select and develop stormwater retrofit projects from the 156 potential sites identified in the Big Creek Watershed Balanced Growth Plan.

The primary goal of both phases of the project was to identify optimal stormwater retrofit sites in the watershed that would reduce runoff volume; reduce the stormwater peak flow rate; and improve the overall water quality. For both phases, BCC and its technical advisory committee selected Tetra Tech, Inc. to manage the project.

During the first phase of the project, detailed site plans were examined and field assessments were performed on 16 of the top ranked sites. Conceptual plans were developed for the three highest ranking sites. During this second phase, additional criteria were considered while field teams evaluated an additional 62 priority sites. Conceptual designs were developed for two of these sites while another was developed for source control measures along residential streets.

The extensive data collected during this project will be used to develop projects as funding becomes available. To learn more about both project phases visit: bigcreekconnects.org.

This project was funded through the Lake Erie Protection Fund (LEPF) with matching funds provided by the Northeast Ohio Regional Sewer District and General Motors Foundation. The LEPF is supported by the voluntary contributions of Ohioans through donation or purchase of a Lake Erie license plate displaying the Marblehead Lighthouse or the Lake Erie life ring. www.lakeerie.ohio.gov

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INTRODUCTION

The Big Creek Watershed Stormwater Retrofit *Implementation* Project was developed as the second phase of the Big Creek Watershed Stormwater Retrofit *Ranking* Project completed in April 2013. Both project phases were initiated by Big Creek Connects (BCC), formerly Friends of Big Creek, to complement land use practices identified in the Big Creek Watershed Balanced Growth Plan. The community partners in the Balanced Growth Plan include the cities of Brook Park, Brooklyn, Cleveland, Parma, and Parma Heights. All data obtained from these projects is to be made available to each community.

This second phase of the project was funded with $15,000 from the Ohio Lake Erie Protection Fund and $1000 from the General Motors Foundation to hire the project consultants, Tetra Tech, Inc. Funding for Big Creek Connects' Executive Director as the project director for $3,150 was through the Northeast Ohio Regional Sewer District's Operating Support Grant. An additional $2,580 worth of assistance in field work was provided by the Cuyahoga County Board of Health and the Cuyahoga Soil & Water Conservation District, while an estimated $480 worth of website and media support was provided by BCC's Board Chair.

Upon award of funding for the project, BCC re-formed its technical advisory committee (TAC) used during the first phase of the project. The TAC's role was to provide oversight in the development and implementation of the project. One or two representatives from each of the following entities formed the TAC: Ohio EPA, Cuyahoga County Board of Health (CCBH), Cuyahoga Soil and Water Conservation District (CSWCD); Cleveland Metroparks, Northeast Ohio Regional Sewer District, and the Cuyahoga River Community Planning Organization/Cuyahoga River RAP.

To insure continuity of the project, BCC again selected Tetra Tech, Inc. as the project consultant, after contract terms were agreed upon. Tetra Tech's Jennifer Olson acted as the team leader with John Stein as her project assistant. CCBH and CSWCD staff assisted Tetra Tech in field research.

Following is the Summary Report for the project prepared by the project consultants, followed by a conclusion to this Technical Report. The Summary Report with its appendices can be found at BigCreekConnects.org.

SUMMARY REPORT

TETRA TECH

The Big Creek Watershed Stormwater Retrofit Ranking Project (Project) was initiated to help further the work completed as part of the Big Creek Watershed Balanced Growth Plan. The primary goal of this project was to identify the optimal stormwater retrofit sites in the watershed that would achieve the following goals:

- Reduce runoff volume
- Reduce the stormwater peak flow rate
- Improve the overall water quality

This project is a continuation of previous efforts documented in an April 29, 2013 summary report for the Initial Retrofit and Ranking Project. This memorandum summarizes the additional tasks completed as part of Phase 2 and associated findings.

Ranking of Potential Retrofit Sites

The Initial Big Creek Watershed Stormwater Retrofit Ranking Project included a desktop analysis to rank potential retrofit sites identified in the 2010 Big Creek Watershed Balanced Growth Plan. These sites included:

- 69 Large parking lots > 5 acres
- 35 Modified existing dry basins
- 46 New storage below outfalls
- 6 Storage areas at highway interchanges

Phase 1 of the Big Creek Retrofit and Ranking Project included an analysis of parking lots totaling at least 5 acres in size. However, this approach did not address rooftop imperviousness, which also contributes significantly to runoff. An analysis of rooftops totaling at least 5 acres in size that were not part of sites already included in the 156 potential retrofit sites resulted in 10 new sites. In addition, communications between Big Creek Connects, landowners, municipalities and Northeast Ohio Regional Sewer District (NEORSD) has generated one new potential retrofit site, Drifter Sport and Travel Bag, for inclusion in the analysis.

Sites were identified as High, Medium, or Low priority according to the criteria included as part of the Phase 1 project which ranked sites according to the following:

- Drainage area – area that drains to a retrofit site
- Impervious area – impervious area within the drainage area
- Estimated annual total suspended solids (TSS) loads – estimated pollutant load within the drainage area
- Treatment area – area at the retrofit site that can be used for treatment from the contributing drainage area

The NEORSD's Regional Inter-Community Drainage Evaluation (RIDE) Study results were also evaluated to determine if these results would help inform priority site selection for field evaluation. Based upon review, the extent of reported problem areas and negatively impacted stream sections covers the entire Big Creek watershed. Given the widespread nature of these impacts, the NEORSD RIDE study did not refine the analysis or targeting of specific areas.

In addition to the potential retrofit sites identified above, watersheds which drain to existing basins or outfalls can provide opportunities to treat runoff near the source, thus reducing the volume of runoff and pollutants reaching the downstream basin or outfall. These source control areas (i.e., watersheds) can be

targeted for stormwater control measures (SCMs) implementation during road reconstruction projects or other large construction projects. Example retrofits could include green streets, linear bioretention, and porous pavement. Source controls are also targeted in existing residential areas.

A desktop analysis of the land use and parcel information can provide sufficient detail about the watershed characteristics such as typical street width and imperviousness and common sources and pathways for runoff. Figure 2 presents three representative residential area types based on size of parcel, road configuration, and typical imperviousness.

Field Investigation

Sixteen properties which included 27 potentially high priority SCM retrofits were field visited during the Phase 1 project. During Phase 2, an additional 62 priority sites were field investigated during the fall and winter of 2013-2014 (see Figure 1 and Summary Table at end of report). Twenty-one high priority sites and 41 medium priority sites were visited. The ten remaining high priority sites include four on Ford's property and six Ohio Department of Transportation District 12 interchanges. Tetra Tech staff, Jared Bartley (Cuyahoga Soil and Water Conservation District) and Meiring Borcherds (Cuyahoga County Department of Health) conducted the field work. Three residential areas were also field investigated.

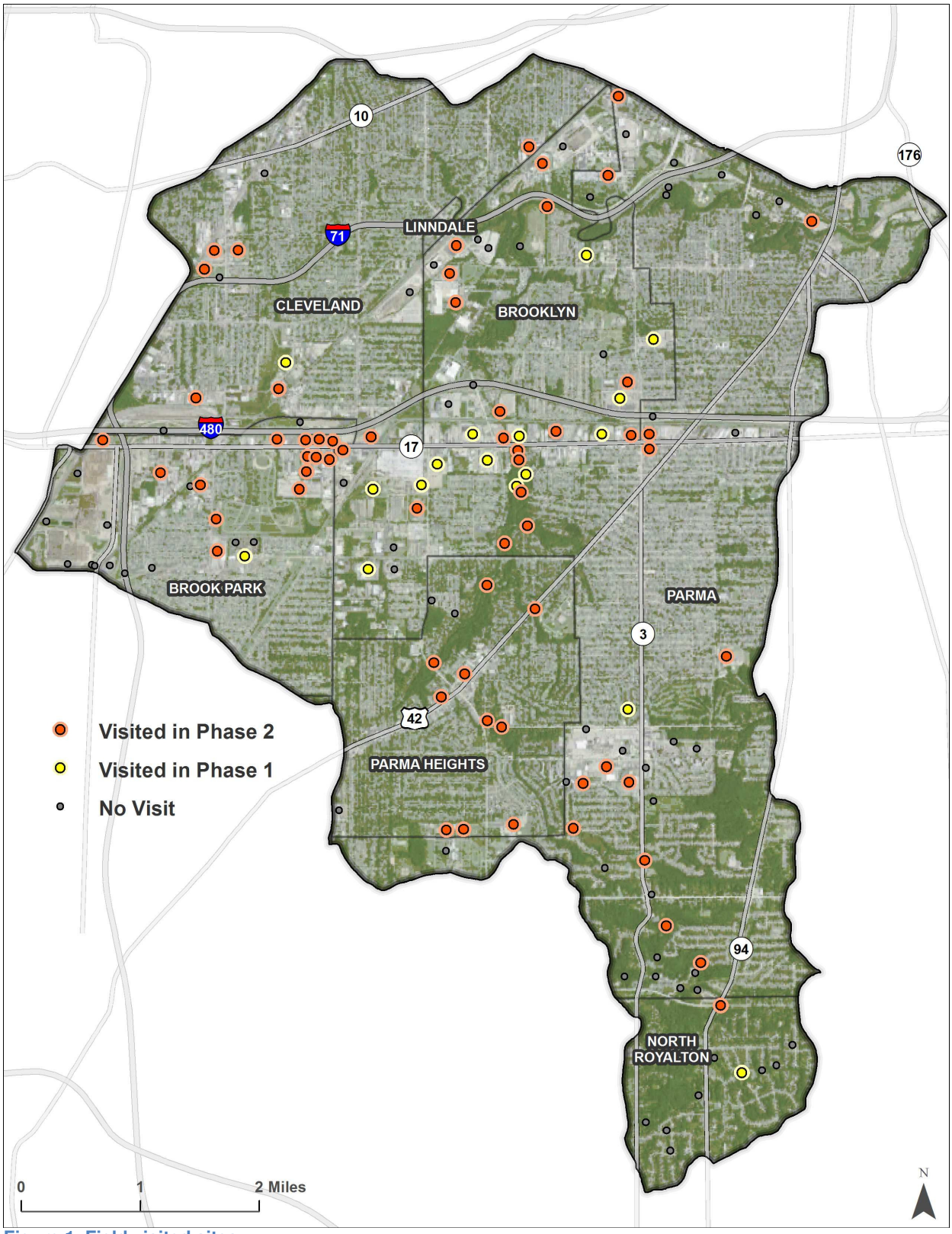


Figure 1. Field visited sites

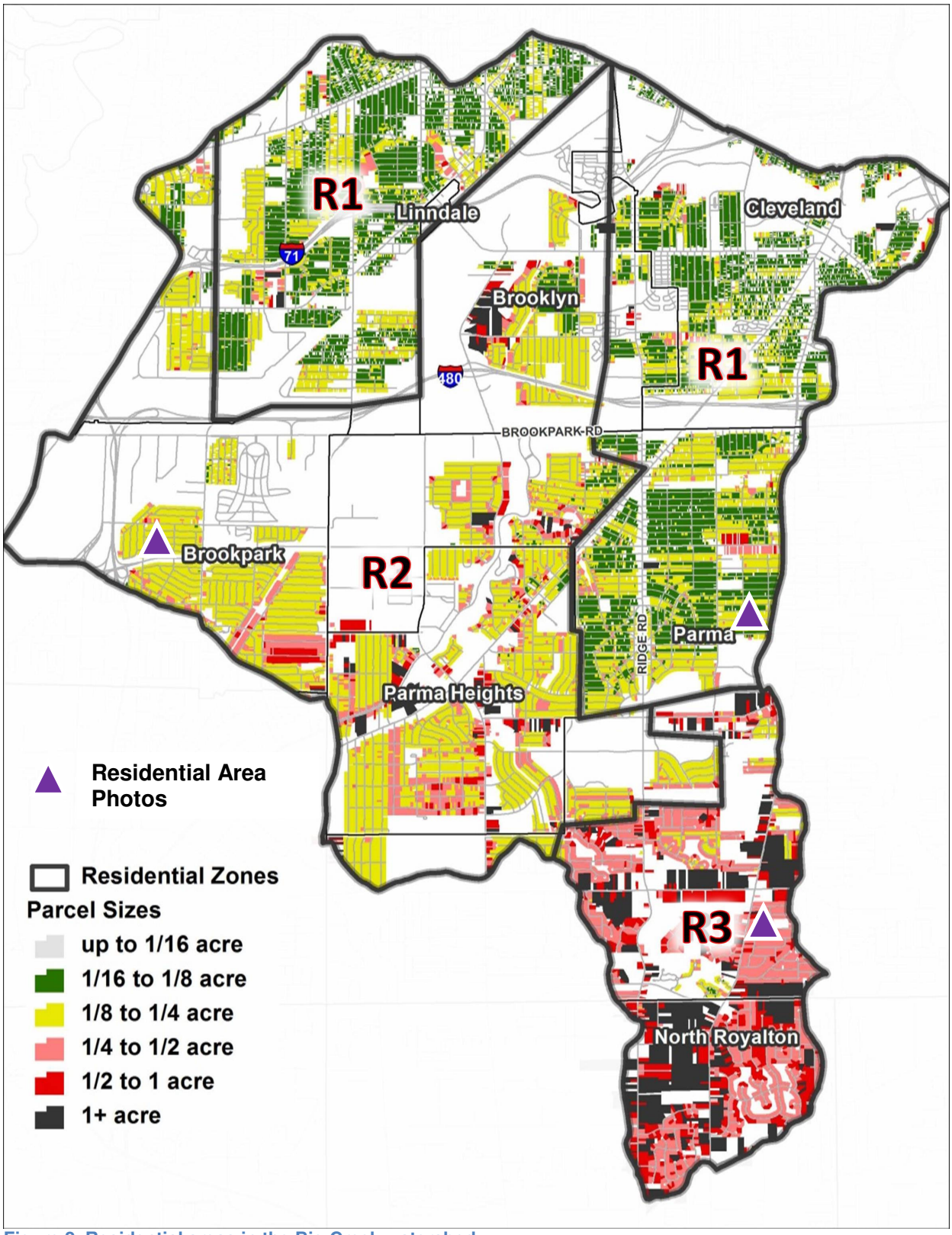


Figure 2. Residential areas in the Big Creek watershed

A windshield survey was conducted in each of the three representative residential areas to gather information such as typical presence or absence of rooftop downspout connections, available green space, and roadway right of way configuration. A variety of SCMs can be used in residential neighborhoods to treat runoff associated with rooftops, driveways, and roads. Typically, a suite of SCMs are used including permeable pavement and bioretention that includes bioswales and rain gardens.

Residential 1 (R1)

The R1 area is characterized by homes built between 1930 and 1950 with detached garages and driveways (Figure 3). Sidewalks are typically present on both sides of the streets with fairly narrow tree lawns. There is limited front yard green space. Roofs appear to consistently be connected to sewers which include both separate and combined sewers, depending on location. Residential streets are typically two lane roads without a separate parking lane. On-street parking was observed, however overnight parking did not appear to be typical. Trees are less common in front yards and near streets. Many of the tree lawns are too small to support bioretention or bioswales, however opportunities for bioretention may exist in other parts of this residential area such as in bump out areas at road intersections. Reducing imperviousness associated with the street or using permeable pavement in the parking lane is recommended.

Figure 3. Example R1 neighborhood

Residential 2 (R2)

The R2 area contains homes built in the 1950s or 1960s with detached garages and driveways (Figure 4). Homes are set close to the street and there are generally sidewalks on both sides of the street. Trees are common in narrow tree lawns. There is limited green space in this style of residential development. Roofs appear to consistently be connected to sewers which include both separate and combined sewers, depending on location. Residential streets are typically two lane roads without a separate parking lane. Permeable pavement in narrow strips on either side of the road is recommended or bioretention in bump-out areas at road intersections.

Figure 4. Example R2 neighborhood

Residential 3 (R3)

The R3 area contains homes built in the 1970s or 1980s with attached garages and driveways (Figure 5). Homes are set back from the street and there are generally no sidewalks. Roofs appear to consistently be connected to sewers, which are separate from sanitary sewers in this area. Residential streets are typically two lane roads without a separate parking lane. While there are maturing trees present in many front yards, opportunities exist to install rain gardens or bioretention areas in tree lawns or as bump-outs at road intersections.

Figure 5. Example R3 neighborhood

Ranking of Field Investigated Sites

The primary criteria used to rank field investigated sites included:

- Planned Priority: Planned Project or Stakeholder Interest
- Constructability: Known Utility or Site Constraints
- Coordination: Type and Number of Property Owners (e.g., private vs. public)
- Education Opportunity: Good Visibility for Demonstration Project

Planned Priority: Planned Projects or Stakeholder Interest – Planned projects will be evaluated regarding their proximity to potential retrofit sites, since either the project may be addressing one of the watershed goals to mitigate known flooding, erosion, or water quality concerns, or an opportunity may exist to incorporate those type of solutions prior to design and/or construction. Similarly, retrofit sites that have willing and interested stakeholders (e.g. cities, county, and landowners) will be identified and given a higher priority ranking than sites with unknown interest.

Constructability: Known Utility or Site Constraints – sites with known site or utility constraints are ranked lower than sites without known constraints. Sites with large roofs that were internally drained received a low ranking.

Coordination: Type of Property Owners (Public or Private) – publicly owned properties will receive a higher priority ranking compared to private property owners.

Coordination: Number of Property Owners (Single or Multiple) – sites with multiple property owners are ranked lower than those with a single property owner.

Education Opportunity: Good Visibility for Demonstration Project

All criteria received equal weight in the ranking with the exception of sites where stakeholder or land

owner interest was high which received a higher weight. A review of available information on reported flooding, erosion, and water quality issues did not identify any areas as higher priority over others. Reported issues are widespread throughout the watershed, therefore this ranking criteria was not used. In addition, the overall impression in the field is included in the ranking. Each site was ranked 1 (strong recommendation) to 3 (limited recommendation) based on retrofit potential when observed in the field.

The Summary Table at the end of this report provides the rankings for all field Phase 2 visited sites. Field summary sheets are provided in Appendix B.

The highest ranking sites from Phase 2 and several high ranking sites from Phase 1 were considered for concept plan development (Table 1). Sites that received at least 15 points in ranking and received a Strong Recommendation from field staff are provided in Table 1 along with high ranking sites from Phase 1. The Brooklyn Fire Station and the Family Dollar/US Bank (known as Dave's market/Neighborhood Family Practice) were also added to the list of high ranking sites due to stakeholder/owner interest.

Table 1. Highest ranked sites

Site ID	Site Name	Task 2 Totals	Notes
120	Parma South Branch Library	20	Change of ownership may have occurred which many necessitate re-evaluation
19 or 20	Cuyahoga Community College (TriC)	20	
27	Corporate Bank Transit (PNC)	15	Owner interested
34 or 35	American Greetings	15	Parking lots need maintenance
40	Family Dollar/US Bank	12.5	Owner interest
83	Brookgate Shopping Center	15	Stream is day-lighted on site
A1	Drifter Sport and Travel Bag	20	Owner interest
47	Biddulph Plaza	NA	Stakeholder interest
90	Brooklyn Fire Station	NA	Stakeholder interest
57	Home Depot	NA	
64	GM South Parking Lot	NA	See Site 63 field sheet
78	Brookpark Rd RTA	20	
127	Puritas RTA/La Quinta Inn	20	
111	York and Ridgewood Outlet	15	
112	BC Parkway North of Snow Outlet	15	Outlet is near BC Parkway and causing erosion in channel leading to Creek, space appears available for storage retrofit
92	BC Parkway South of Snow Outlet	17.5	

SCM Retrofit Conceptual Plans

Three conceptual retrofit plans were developed including a parking lot retrofit for Tri-C in Parma Heights, a parking lot/pedestrian walkway connection at the Family Dollar/US Bank Site, and a green street retrofit. Property owners at both private sites expressed interest in potentially retrofitting their sites.

Site 20 – Cuyahoga Community College (Tri-C), Parma Heights

Site 20 is a proposed parking lot retrofit on the Tri-C campus in Parma Heights. The selected parking lot has very good visibility and is actively used. There is no known water quality treatment, flood control, or rate control for the parking lot. Approximately 38 percent of the parking lot will be treated. The goals of the retrofit project include providing water quality treatment and volume control and providing an educational opportunity for students and visitors.

The proposed retrofit includes converting existing grassed medians to bioretention areas (see Figure 6 for examples and Table 2). Bioretention areas would be depressed one foot allowing for 6 inches of ponded water. The retrofit concept assumes that curb cuts can be installed along the existing median curbs to allow for runoff to enter the bioretention areas. A new overflow structure is proposed to connect bioretention overflow with the existing storm sewer inlets and catch basins. This design would have a minimal impact on parking lot use. Various planting plans can be considered for the bioswales depending on Tri-C's ability to provide budgeted maintenance. Bioretention areas can be manicured (see pictures below) or can be allowed to be more natural. Native plantings, which are recommended for this site, can provide a higher level of volume control when compared with turf grass as a result of deep roots and higher levels of evapotranspiration.

Figure 6. Left: Native grasses in a landscaped bioretention area (MN); Right: Grassed bioretention area (IL)

Table 2. Design assumptions

Number of bioretention areas	10
Length of bioretention areas	182 feet
Top width of bioretention areas	7 feet
Bottom width of bioretention areas	4 feet
Ponded depth	6 inches
Drainage area to one bioretention area	7,600 square feet (100% impervious)
Volume of one bioretention area	500.5 cubic feet

A design alternate could include placement of permeable pavement in untreated portions of the parking lot which could then connect to the proposed bioretention areas for additional treatment and conveyance. The entire site could likely be treated using this design; however costs and opportunity make this a less desirable choice. Mature trees along the medians should be protected, therefore bioretention areas are not proposed for the main access road. The proposed concept design would exceed Ohio EPA water quality standards and provide additional flood control for the treated areas.

The conceptual planning level cost estimate for this proposed stormwater retrofit ranges between $280,000 and $325,000 and includes probable construction costs, design, survey, permitting, and a 15-25 percent contingency. The lower cost estimate assumes a lower contingency associated with a high level of participation by Tri-C staff and students. The higher cost estimate assumes a higher contingency and assumes a lower level of participation by Tri-C and staff.

Cuyahoga Community College
Parking Lot Retrofit Conceptual Design (Site 20)

Existing Conditions

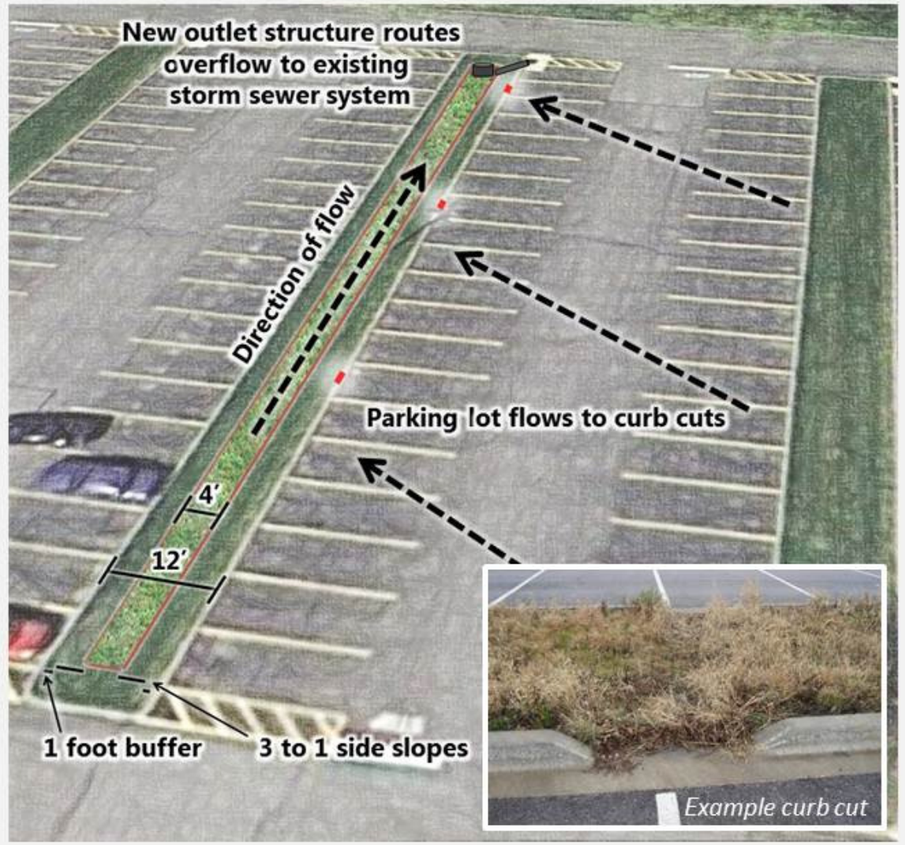
Total site area (acres):	6.1
Imperviousness (%):	70
Pollutant loading (lbs of sediment/year):	2,440

General Findings: Existing parking lot is well utilized and maintained. Grassed medians are present throughout. Site is served by catch basins and storm sewer located adjacent to grassed medians.


Existing grass median


Conceptual grass median

Proposed Concept Design



Retrofit Description: Ten existing grassed medians will be converted to bioretention areas. Depressions will be 1 foot deep maximum, allowing 6 inches of ponded water. Runoff will be routed to bioretention areas through new curb cuts. New outlet structures will be used to connect bioretention areas and existing catch basins. A planting plan that is prominently herbaceous native plants that are water tolerant is recommended. Costs assume volunteers planting the vegetation.

Total area to be treated (acres):	2.3
Proposed storage volume (acre-feet):	0.11
Percent of Ohio EPA water quality volume:	118%
Additional flood control volume (acre-feet):	0.02
Pollutant load reduction (lbs of sediment/year):	740

Retrofit Cost Estimate: $280,000 - $325,000

Big Creek Connects

TETRA TECH

Family Dollar/US Bank (Dave's Market/Neighborhood Family Practice) (Site 40)

Site 40 is proposed parking lot retrofit for an existing private commercial area in Cleveland. This site is located at the corner of Denison and Ridge, both heavily traveled roads. The proposed retrofit is multi-functional, serving to both create a safe pedestrian trail between Denison and Ridge with access to local commercial sites and to provide stormwater treatment for an otherwise untreated site. The overall site includes several existing buildings and three parking lots. A currently vacant property is located near the center.

The proposed retrofit consists of a permeable pavement sidewalk with a two foot gravel storage layer beneath, served by an underdrain that will connect to existing storm sewer pipes on site. Porous concrete is recommended, and trees will be placed along the SCM to create shade and contribute to cooling of the paved surfaces. The trees will also help define the sidewalk for both users and those driving in the parking areas. The proposed permeable sidewalk will intercept over three acres of parking lot and provide storage for the 0.8 inch rainfall event. This site provides an educational opportunity.

Permeable pavement can become clogged by sediment; therefore a maintenance plan is needed to ensure regular sweeping for removal of sediment and leaf litter, and careful use of parking lot sealants. Depending on the material selected for the permeable pavement, information for snow plowing and snow storage may be needed.

The conceptual planning level cost estimate for this proposed stormwater retrofit ranges between $190,000 and $230,000 and includes probable construction costs, design, survey, permitting, and a 25 percent contingency. Cost estimates are based on permeable pavement installations in Northeast Ohio in the past 4 years. Table 3 summarizes the calculations for the entire site.

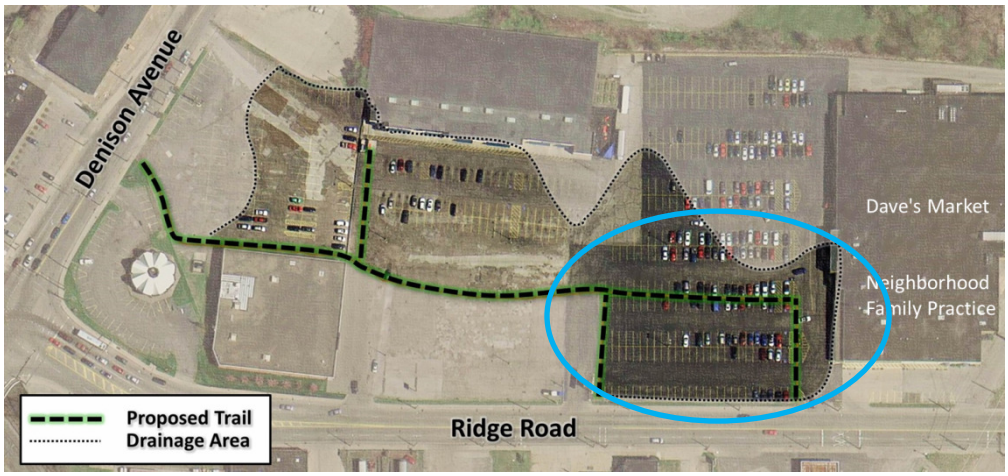


Figure 7. Potential area being considered for retrofit.

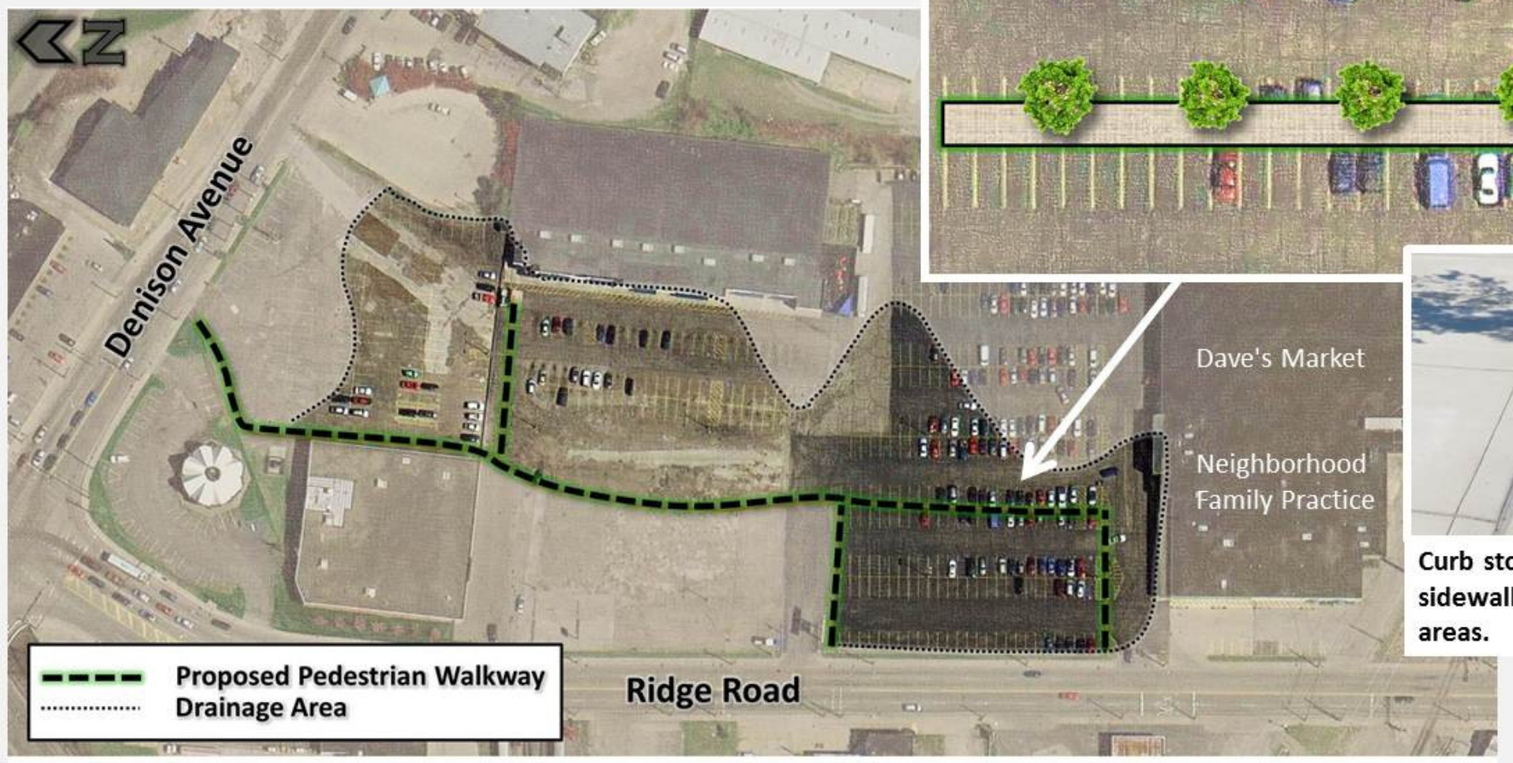
The portion of the site that includes the Dave's Market and Neighborhood Family Practice parking lots is currently being considered for retrofit (see Figure 7). A grant application was submitted in 2014 to the NEORSD for consideration.

Table 3. SCM design calculations

SCM size (8 foot wide, 1,330 linear feet)	10,650 square feet
Drainage area to SCM	3.5 acres
Proposed storage (2 foot gravel storage layer)	0.24 acre-feet
Proposed Ohio EPA Water Quality Volume (%)	124%
Additional flood control volume (above water quality volume)	0.05 acre-feet
TSS load reduction	1,130 lbs/yr
Assumed number of trees	30
Estimated costs	$190,000 – $230,000

Dave's Market / Neighborhood Family Practice
Parking Lot / Pedestrian Walkway Conceptual Design
(Site 40)

Project Location



Curb stops can be used when sidewalk is adjacent to parking areas.

Existing Conditions: Three large parking lots and one vacant area. No stormwater management on site. Site drains from east to west, existing stormsewers and catch basins are present.

Retrofit Description: A porous concrete sidewalk/walkway will be installed to provide connectivity between Denison Avenue, retail and services in the existing commercial area, and Ridge Road. Trees will be placed along the sidewalk at grade to provide shade and to further delineate the sidewalk. The sidewalk will collect parking lot runoff from the existing commercial area. A two foot gravel storage layer beneath the sidewalk will provide storage for runoff and an underdrain will be used to ensure proper drainage. Runoff entering the permeable pavement will be available for tree uptake. A maintenance plan will be needed that includes frequent sweeping of permeable pavement and leaf litter removal.

Color can be added to the porous concrete sidewalk to distinguish it from nearby driving surfaces.

Total area to be treated (acres):	3.5
Proposed storage volume (acre-feet):	0.24
Percent of Ohio EPA water quality volume:	100%
Additional flood control volume (acre-feet):	0.05
Pollutant load reduction (lbs of sediment/year):	1,130

Retrofit Cost Estimate: $190,000 - $230,000

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Big Creek Connects

TETRA TECH

Source Control Retrofit Conceptual Design (Typical Residential Street)

A retrofit concept design was developed for a typical residential street in the Big Creek watershed to provide stormwater treatment of street runoff. Many of the streets in the Big Creek Watershed are untreated and account for a significant amount of imperviousness and pollutant loading to Big Creek.

A green street concept was developed that could potentially be used during residential road reconstruction projects. The conceptual design includes a small bioswale and bump-out at the intersection, similar to those in Figure 8. This type of retrofit, when incorporated into an existing street reconstruction project, can be an affordable and effective way to provide small scale water quality treatment and runoff retention. Bump outs with bioswales can also be incorporated along the street length which can also be used for traffic calming.

The bioswale design includes a curb cut to collect runoff from the gutter and a depressed area that can serve as a small ponding area. Swales and bump-outs can be vegetated with either turf grass or native plants. These corner gardens can be neighborhood amenities. Private-public maintenance agreements can be developed as a tool to ensure effective SCM operation and maintenance.

The planning level cost estimate is $46,000 - $54,000 per intersection, although this assumes that bump-outs and bioswales are installed on all eight corners and also assumes that this retrofit does not take place as part of an existing road reconstruction project. An individual bioswale with bump-out is estimated at $5,000 - $7,000.

Figure 8. Example Bump Out at Road Intersections.

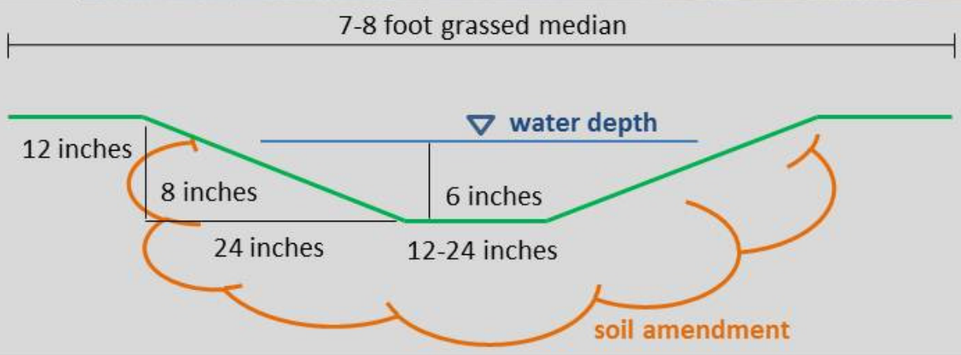
Source Control Retrofit Conceptual Design

Existing Conditions

Total site area – street and driveways draining to intersection (sq ft):	41,280
Imperviousness (%):	100
Pollutant loading (lbs of sediment/year):	379

General Findings: Residential streets are generally untreated in the watershed and they make up 10-15 percent of the total watershed imperviousness. Typical streets include 12 foot driving lanes and no on-street parking. Sidewalks are common, and tree lawns are 6-8 feet in width.

Proposed Concept Design



Retrofit Description: Bioswales are proposed to treat runoff from residential streets and driveways. Bioswales are approximately 7-8 feet in width, depending on available right of way with six inches of ponded water. Bump outs that add 2-3 feet of additional width to the swale are proposed at intersections with 9 inches of ponded water. Runoff will be routed to bioswales/bump outs through new curb cuts that will also serve as overflow structures. An average length of 50 feet is assumed. A planting plan that is prominently herbaceous native plants that are salt and water tolerant is recommended.

Total area to be treated (per intersection) (sq ft):	41,280
Proposed storage volume (cubic feet):	833
Percent of Ohio EPA water quality volume:	36%
Additional flood control volume (cubic feet):	0
Pollutant load reduction (lbs of sediment/year):	110

Retrofit Cost Estimate:
$46,000 - $54,000 per intersection

Summary Table, Phase 2

Site_ID	Site_ Type	Site_Name	Owner _Type	Phase 2 Priority	Phase 2 Visit	Municipality	Planned Priority? (Y = 10 or N = 0)	Site Constraints? (Y=0 or N=5)	Ownership (Public = 5, Private = 0)	High Level of Coordination Needed? (Y=0 or N=5)	Education Opportunity? (Y=5 or N=0)	Task 2 Totals	Site Recom-mendation	Notes
5	O	Church in the Woods	Private	M	Tt	Parma Hts	0.0	5.0	0.0	5.0	0.0	10	3	Property was for sale at time of field visit.
6	O	Sandy Hook Park	Public	H	Tt	Parma	0.0	0	5	5	0	10	3+	
10	P	Giant Eagle	Private	H	Tt	Parma	0.0	5.0	0.0	5.0	0.0	10	2	
11	P	Kohl's	Private	H	Tt	Parma	0.0	0	0	5	2.5	7.5	3	Site constrained due to recent parking lot updgrades, expect limited owner interest.
19	P	Tri C	Public	H	Tt	Parma Hts	0	5	5	5	5	20	1	
20	P	Tri C	Public	H	Tt	Parma Hts	0	5	5	5	5	20	1	
27	P	Corporate Bank Transit	Private	H	Meiring	Cleveland	0	5	0	5	5	15	1	Owner interested.
29	P	Trucking Facility on W 161st	Private	M	Jared	Brook Park	0	0	0	5	0	5	3	
31	P	Penske Truck Rental	Private	M	Jared	Brook Park	0	0	0	5	0	5	3	Potential for floodplain restoration adjacent to site.
34	P	American Greetings	Private	H	Meiring	Brooklyn	0	5	0	5	5	15	1	Parking lots need maintenance.
35	P	American Greetings	Private	H	Meiring	Brooklyn	0	5	0	5	5	15	1	Parking lots need maintenance.
36	P	Gateway Safety Inc	Private	M	Meiring	Brooklyn	0	5	0	5	0	10	2	
38	P	Arrow International	Private	M	Meiring	Brooklyn	-10	0	0	5	2.5	-2.5	3	Site is already treated.
40	P	Family Dollar/US Bank	Private	M	Meiring	Cleveland	0	5	0	5	2.5	12.5	2	
42	P	Ridge Road Bus Maintenance	Public	M	Meiring	Cleveland	0	0	5	5	5	15	2	Probable redevelopment site
46	P	Cleveland Zoo	Public	M	Tt	Cleveland	-10	5	5	5	5	10	3	Site has been retrofitted.
49	P	General Cinemas	Private	M	Tt	Brooklyn	0	5	0	5	0	10	2	
51	P	Staples	Private	M	Tt	Brooklyn	0	5	0	5	0	10	2	
52	P	HH Gregg	Private	M	Tt	Cleveland	0	5	0	5	0	10	2	
53	P	Ganley Hyundai	Private	M	Tt	Parma	-10.0	5.0	0	5	0	0	3	Site has already been upgraded with on-site bioretention
55	P	Sams Club	Private	M	Tt	Brooklyn	0	5	0	5	0	10	2	
63	P	GM	Private	H	Jared	Parma		5	0	5	0	10	2	Site may have transferred ownership.
67	P	Allied Buildings Productts	Private	M	Jared	Cleveland	0	0	0	5	0	5	3	
68	P	Malley's Chocolates	Private	M	Jared	Brook Park	0	5	0	5	2.5	12.5	2	Site may already be treated, large underutilized parking surfaces could be removed.
69	P	Metro Lexus	Private	M	Jared	Brook Park	0	5	0	5	0	10	2	Permeable pavement retrofit.
70	P	Sunbelt Rentals	Private	M	Jared	Brook Park	0	0	0	5	0	5	2	Portion of site could be treated.
71	P	Center City International	Private	M	Jared	Brook Park	0	0	0	5	0	5	3	
72	P	Fed-Ex	Private	M	Jared	Brook Park	0	5	0	5	0	10	2	Site is now a car dealership, opportunity for permeable pavement.
73	P	Abandoned Lot on W 137th	Private	M	Jared	Brook Park	-10	5	0	5	0	0	3	Site has been re-development, contains treatment.
74	P	Metro Toyota	Private	M	Jared	Brook Park	0	5	0	5	0	10	2	Permeable pavement retrofit.
75	P	Hopkins Transportation	Private	M	Jared	Brook Park	0	0	0	5	0	5	2	Possible off site retrofit
76	P	Spitzer Motor City	Private	M	Jared	Parma	0	5	0	5	0	10	2	Permeable pavement retrofit.
78	P	Brookpark Rd RTA	Public	M	Jared	Brook Park	0.0	5	5	5	5	20	1	
79	P	GLS Leasco	Private	H	Jared	Brook Park	0.0	0	0	5	0	5	2	Site constrained due to possible site contamination from truck storage, interesting opportunity for riparian restoration.
83	P	Brookgate Shopping Center	Private	H	Jared	Brook Park	0.0	5.0	0	5.0	5.0	15	1	Stream is daylighted on site.
84	P	Big Lots	Private	M	Tt	Parma Hts	0	5	0	5	0	10	2	
89	O	Apple Creek Drive (Near Landfill)	Private	M	Meiring	Brooklyn	0	0	0	5	0	5	2	Outfall not located, lots of space to include storage.
91	O	Tiedeman Substation	Private	M	Tt	Brooklyn	0	0	0	5	0	5	3	
92	O	BC Parkway South of Snow	Public	M	Tt	Parma Hts	0	2.5	5	5	5	17.5	2	Smaller opportunity
93	O	Creekside Development	Public	H	Tt	Parma Hts	0.0	0	5	0	0	5	3+	
103	O	The Escape Salon	Private	M	Tt	North Royalton	0	0	0	0	0	0	3	Outfall not located, recent utility work has been done

Site_ID	Site_ Type	Site_Name	Owner _Type	Phase 2 Priority	Phase 2 Visit	Municipality	Planned Priority? (Y = 10 or N = 0)	Site Constraints? (Y=0 or N=5)	Ownership (Public = 5, Private = 0)	High Level of Coordination Needed? (Y=0 or N=5)	Education Opportunity? (Y=5 or N=0)	Task 2 Totals	Site Recom-mendation	Notes
110	O	Greenwood Outfall	Private	M	Tt	Parma	0	0	0	0	0	0	3	Wetland is full of invasives.
111	O	York and Ridgewood	Public	M	Tt	Parma Hts	0	2.5	5	5	2.5	15	1	
112	O	BC Parkway North of Snow	Public	M	Tt	Parma	0	5	5	5	0	15	1	Possible for storage area near outlet
114	O	Fern Hill at Brookpark Rd	Public	M	Tt	Parma	0	5	5	5	0	15	2	
115	O	Fern Hill at BC Apartments	Public	M	Tt	Parma	0	5	5	5	0	15	2	
117	O	New Outfall along Parkway	Public	M	Tt	Parma	-10	0	5	5	0	0	3	Recently re-constructed outfall > 36 inches.
119	O	Arbor Park Village	Private	M	Tt	Parma	0	0	0	0	0	0	3+	Did not locate outfall
120	O	Parma South Branch Library	Public	H	Tt	Parma	0.0	5.0	5	5.0	5.0	20	1	Change of ownership may have occurred which many necessitate re-evaluation.
121	O	BC Parkway near Oakdale	Public	M	Tt	Parma	0	5	5	5	0	15	2	Existing swale could be enhanced.
122	O	Near Holy Cross Cemetery	Private	M	Jared	Brook Park	0.0	0.0	0	0	5.0	5	3	
123	O	Selwick Park	Public	H	Tt	Parma	0.0	0	5	5	5	15	2+	
124	O	Stumph Road and BC Parkway	Public	M	Tt	Parma Heights	0	0	5	5	0	10	3	Maintenance needed at this site - manhole cover was removed.
127	P	Puritas RTA/La Quinta Inn	Public	M	Meiring	Cleveland	0.0	5.0	5.0	5.0	5.0	20	1	
A1	P	Drifter Sport and Travel Bag	Private	H	Tt	Parma Hts	10.0	5.0	0.0	5.0	0.0	20	1.0	Owner interested.
R1	R	Buckeye Brewing Company	Private	H	Meiring	Cleveland	0.0	0.0	0.0	5.0	0.0	5	2.0	Rooftop is internally drained.
R2	R	Kaplan Career Institute / Harvest Net Institute	Private	H	Tt	Brooklyn	0.0	0.0	0.0	5	0	5	2	Rooftop is internally drained.
R5	R	Parma High School	Public	H	Tt	Parma	0.0	0.0	5	5	5	15	2	Rooftop is internally drained.
R6	R	Valley Forge High School	Public	H	Tt	Parma	0.0	0.0	5	5	5	15	2	Rooftop is internally drained.
R7	R	Progressive Plastics	Private	H	Meiring	Cleveland	0.0	0.0	0	5.0	0	5	2	Ample green space for treatment opportunity, rooftop is internally drained. Some treatment exists.
R8	R	US Cotton / Hastings Professional Medical Equipment	Private	H	Meiring	Cleveland	0.0	0.0	0	5	0	5	3	Rooftop is internally drained.
R9	R	Oatey (Pepsi?)	Private	M	Meiring	Cleveland	0	0	0	5	0	5	3	Rooftop not investigated, assume it has internal drains.

Highest ranked sites

-10 given to sites with current treatment

Sites that were field visited as part of Task 2

Site Name	Site Number	Type	City	Owner ship	Task 1 Priority
Church in the Woods	5	O	Parma Heights	Private	M
Sandy Hook Park	6	O	Parma	Public	H
Giant Eagle	10	P	Parma	Private	H
Kohl's	11	P	Parma	Private	H
Tri C	19	P	Parma Heights	Private	H
Tri C	20	P	Parma Heights	Public	H
Corporate Bank Transit	27	P	Cleveland	Private	H
Trucking Facility on W 161st	29	P	Brook Park	Private	M
Penske Truck Rental	31	P	Brook Park	Private	M
American Greetings	34	P	Brooklyn	Private	H
American Greetings	35	P	Brooklyn	Private	H
Gateway Safety Inc	36	P	Brooklyn	Private	M
Arrow International	38	P	Brooklyn	Private	M
Family Dollar/US Bank	40	P	Cleveland	Private	M
Ridge Road Bus Maintenance	42	P	Cleveland	Private	M
Cleveland Zoo	46	P	Cleveland	Private	M
General Cinemas	49	P	Brooklyn	Private	M
Staples	51	P	Brooklyn	Private	M
HH Gregg	52	P	Cleveland	Private	M
Ganley Hyundai	53	P	Parma	Private	M
Sams Club	55	P	Brooklyn	Private	M
GM	63	P	Parma	Private	H
Allied Buildings Productts	67	P	Cleveland	Private	M
Malley's Chocolates	68	P	Brook Park	Private	M
Metro Lexus	69	P	Brook Park	Private	M
Sunbelt Rentals	70	P	Brook Park	Private	M
Center City International	71	P	Brook Park	Private	M
Fed-Ex	72	P	Brook Park	Private	M
Abandoned Lot on W 137th	73	P	Brook Park	Private	M
Metro Toyota	74	P	Brook Park	Private	M
Hopkins Transportation	75	P	Brook Park	Private	M
Spitzer Motor City	76	P	Parma	Private	M
Brookpark Rd RTA	78	P	Brook Park	Private	M
GLS Leasco	79	P	Brook Park	Private	H
Brookgate Shopping Center	83	P	Brook Park	Private	H
Big Lots	84	P	Parma Heights	Private	M
Apple Creek Drive (Near Landfill)	89	O	Brooklyn	Private	M
Tiedeman Substation	91	O	Brooklyn	Private	M
BC Parkway South of Snow	92	O	Parma Heights	Private	M
Creekside Development	93	O	Parma Heights	Public	H
The Escape Salon	103	O	North Royalton	Private	M
Greenwood Outfall	110	O	Parma	Private	M
York and Ridgewood	111	O	Parma Heights	Private	M
BC Parkway North of Snow	112	O	Parma	Private	M
Fern Hill at Brookpark Rd	114	O	Parma	Private	M
Fern Hill at BC Apartments	115	O	Parma	Private	M
New Outfall along Parkway	117	O	Parma	Private	M

Site Name	Site Number	Type	City	Ownership	Task 1 Priority
Arbor Park Village	119	O	Parma	Private	M
Parma South Branch Library	120	O	Parma	Public	H
BC Parkway near Oakdale	121	O	Parma	Private	M
Near Holy Cross Cemetery	122	O	Brook Park	Private	M
Selwick Park	123	O	Parma	Public	H
Stumph Road and BC Parkway	124	O	Parma Heights	Public	M
Puritas RTA/La Quinta Inn	127	P	Cleveland	Private	M
Drifter Sport and Travel Bag	A1	P	Parma Heights	Private	H
Buckeye Brewing Company	R1	R	Cleveland	Private	H
Kaplan Career Institute / Harvest Net Institute	R2	R	Brooklyn	Private	H
Parma High School	R5	R	Parma	Public	H
Valley Forge High School	R6	R	Parma	Public	H
Progressive Plastics	R7	R	Cleveland	Private	H
US Cotton / Hastings Professional Medical Equipment	R8	R	Cleveland	Private	H
Oatey	R9	R	Cleveland	Private	M

R = Rooftop, P = Parking Lot, O = Outfall

CONCLUSION

The Big Creek Watershed Stormwater Retrofit Implementation Project provides a comprehensive data base for use by the project partners, Balanced Growth community partners, and private land owners. This data will be made available on the Big Creek Connects website at BigCreekConnects.org.

The first phase of the project completed in 2013 evaluated and ranked the 156 potential sites noted in the Balanced Growth Plan as well as several additional sites. However, funding limited the number of sites we were able to conduct field assessments and further prioritization of those sites. This second phase of the project enabled field assessments of an additional 62 sites above the original 16, and developed three additional conceptual designs.

Big Creek Connects has been working with the tenants, the property owners and other stakeholders to secure funding for construction for the Neighborhood Family Practices/Dave's Market site concept. An application for funding the project through the NEORSD Green Infrastructure Grant program was submitted in August of 2014 through a partnership with NFP and BCC. BCC is also committed to working with Cuyahoga Community College's Western Campus to see the implementation of the conceptual plans for their site. The concept work for bioswales along residential streets as source control measures will be encouraged for consideration throughout the five watershed communities. It is anticipated that this study will assist the communities in securing funding for this purpose.

Additional sites identified in this project will be developed as funding becomes available and incentives such as the NEORSD Regional Stormwater Management Program go into effect.

The Big Creek Watershed Stormwater Retrofit Implementation Project has and will continue to be of value to its stakeholders as a tool to identify the most effective retrofit sites to reduce runoff volume, reduce the stormwater peak flow rate, and improve the overall water quality within the Big Creek watershed. It is also anticipated that this project will continue to act an excellent model for stormwater management methods in similar urbanized watersheds.