Step 5: Analyze and Identify Priority Areas for Conservation / Restoration Using Stormwater Retrofit Techniques

In watersheds where opportunities for conservation of green fields are limited, green infrastructure can still be expanded and watershed function improved when built areas or unused storage areas are seen as restoration sites. Stormwater retrofits are structural practices installed within the stream corridor or upland areas to capture and treat stormwater runoff before it is delivered to the stream. Considering the urban nature of Big Creek, stormwater retrofits will be the primary practice for restoration, since they can treat stormwater pollutants, minimize channel erosion and help restore stream hydrology.

OBJECTIVES

A good set of restoration objectives helps identify what pollutants need to be treated, how much storage is needed and where the most cost-effective locations are in the subwatershed.

Community objectives identified in the “Goals for the Big Creek Watershed Management Plan” included:

1. Improve Water Quality in Big Creek
2. Reduce Flooding

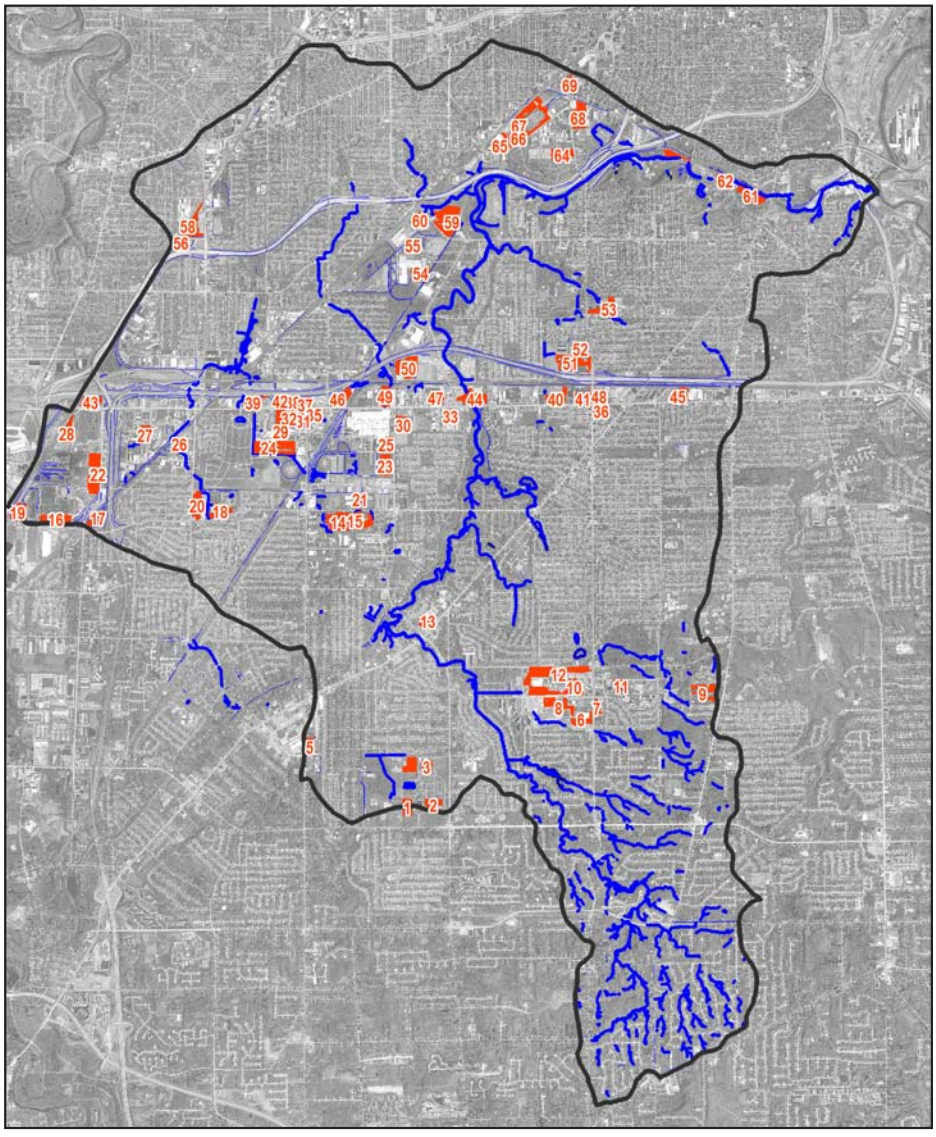
STORMWATER RETROFIT PRACTICES TO TREAT WATER QUALITY AND QUANTITY

LOCATIONS	DESCRIPTIONS
Large Parking Lots (5 acres or greater)	Provide stormwater treatment in open spaces near the outfall the of the parking lot or by incorporating infiltration type best management practices around the perimeter of down the medians of the lot.
Modify Existing Dry Basins	Add water quality treatment/storage to an existing dry pond by excavating new storage on the pond bottom, raising the height of the embankment, modifying riser elevations/dimensions, converting unneeded quantity control storage into water quality treatment storage and/or installing internal design features to improve performance
New Storage Below Outfalls	Flows are split from an existing storm drain or ditch and are diverted to a stormwater treatment area on public land in the stream corridor. Works best for storm drain outfalls in the 12- to 36- inch diameter range that are located near large open spaces, such as parks, golf courses and floodplains.
Storage at Highway Interchanges	Direct runoff to a depression or excavated stormwater treatment area within the right of way of a road, highway, transport or power line corridor. Prominent examples include highway cloverleaf, median and wide right of way areas.

Stormwater Retrofit – Large Parking Lots

Large parking lots are a good retrofit opportunity to treat runoff quality. Large parking lots are defined as five acres or greater in size. Common examples include lots serving municipal buildings, corporations, high schools, shopping malls, community colleges and big box retail stores.

Parking lots are a good retrofit areas because they generate more stormwater runoff and pollutants on a unit area basis than many other land uses. An ideal stormwater retrofit strategy would include installing a stormwater basin in an unutilized land nearby and down gradient. Other retrofit strategies that could be installed onsite include bioretentions, porous pavement and infilrtation trenches.



STORMWATER RETROFIT:
LARGE PARKING LOTS

This map shows locations of 69 large parking lots that could be sites for stormwater retrofits. The sites are concentrated the Brookpark Road corridor, but other sites exist in other portions of the watershed. Some project sites may offer more opportunities than others in terms of cost-effectiveness and desired outcomes.

This is a planning-level analysis; more details will be needed for project implementation.

Priority Conservation / Restoration / Retrofits
Large Parking Lots

STORMWATER RETROFIT STRATEGIES FOR PARKING LOTS

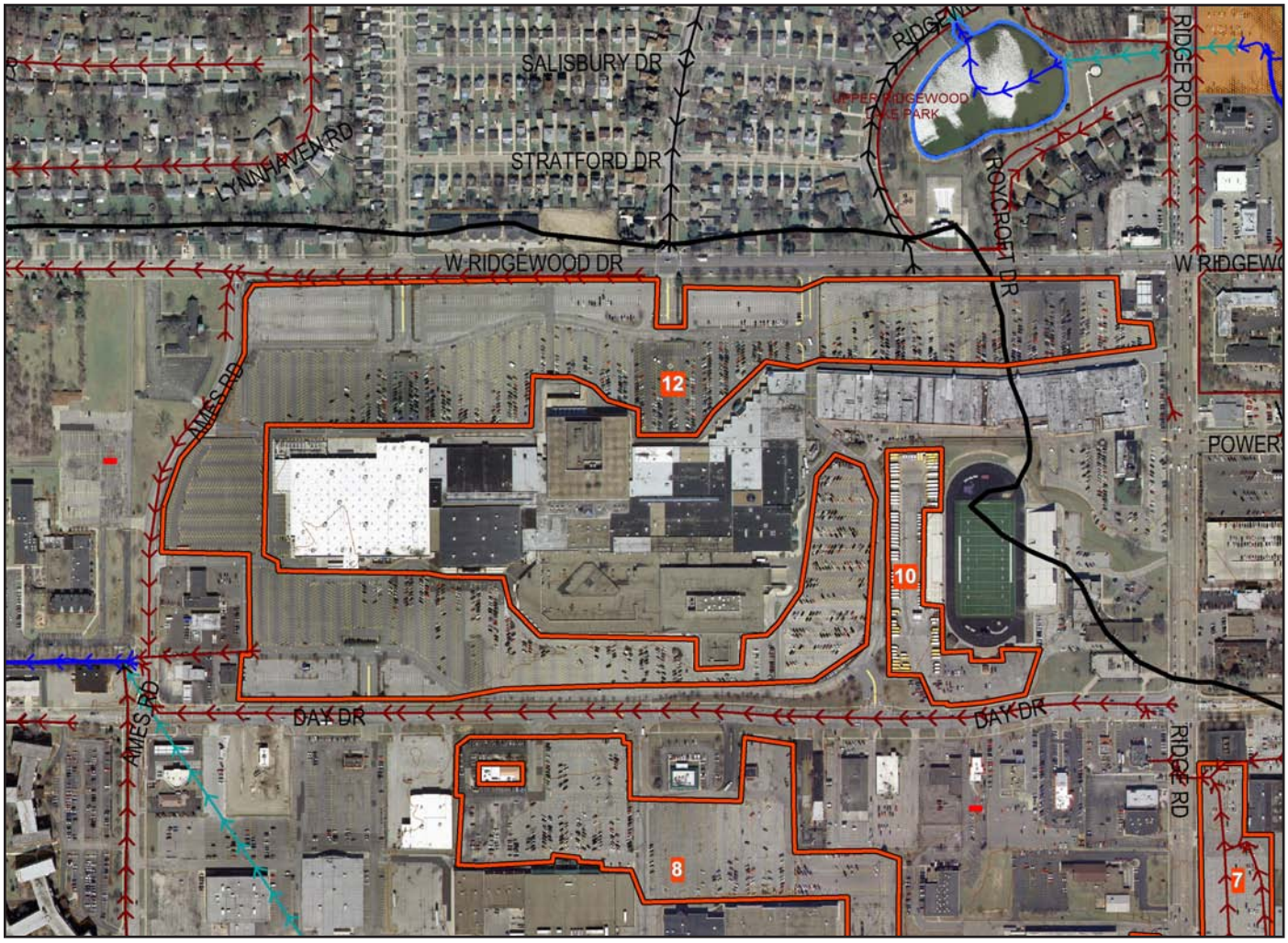
RETROFIT STRATEGIES	DESCRIPTIONS
Wetland Extended Detention Basin	These basins are similar to stormwater basins in that the manage peak flows and flood control. Wetland basins however, are equipped with extra stormwater features such as micropools and wetland habitat to improve the performance in treating the quantity and quality of stormwater.
Bioretention	These practices are designed to treat smaller areas, typically 1 acre or less. Bioretention cells are landscape feature adapted to treat runoff. Runoff is directed and treated to a filter bed similar to a forest floor. Large parking lots can be partitioned with several bioretention areas.
Porous Pavement	Porous pavement consists of multiple layers of various stone and sand size to promote infiltration. Unlike stormwater ponds, porous pavement does not require large amounts of additional space. Instead, rainfall drains through pavement and directly infiltrates the subsurface. This significantly reduces runoff volume, decreases its temperature, improves water quality, and essentially eliminates impervious surface.
Infiltration Trench	Infiltration trenches capture and temporarily store stormwater runoff before infiltrating it into underlying soils, where most pollutants are trapped or storm sewers. Trenches have rock-filled chamber with no outlet, where runoff first passes through a pretreatment, such as a swale or sediment basin. Runoff is then stored in the voids between the stones.

Stormwater Retrofit – Large Parking Lots – EXAMPLE #1`

PARMATOWN MALL IN UPPER BIG CREEK SUBWATERSHED

Parmatown Mall, located in Parma and the Upper Big Creek Subwatershed, contains the largest parking lot measuring at approximately 41 acres. The lot appears not to have any stormwater management practices, contributing large quantities of runoff to Big Creek. This is largely due to the time of development, which occurred prior to current stormwater regulations.

Options- This project area is mostly landlocked without any nearby greenspaces to install a wetland extended detention basin. However, the parking lot itself may offer opportunities. Under-used areas of the lot maybe options for retrofits, such as overflow parking areas for *porous pavement* or even the installation of *extended detention basins*. *Bioretention cells* could be installed as median strips along the parking rows in areas with excessive parking.



Map reference Parking Lot #12

Priority Conservation / Restoration / Retrofits
Large Parking Lots

Stormwater Retrofit – Large Parking Lots – EXAMPLE #2

CLEVELAND METROPARKS ZOO & BROOKSIDE RESERVATION – LOWER BIG CREEK SUBWATERSHED

The Metropark Zoo & Brookside Reservation, located in Cleveland and the Lower Big Creek Subwatershed, contains three parking lots equally approximately 19 acres. These parking lots appear not to have any stormwater management practices, directly contributing runoff to the nearby Big Creek.

Options- This project area offers little in open areas that could be used to install retrofits. However, the parking lots themselves offer opportunities. Areas of the lot offer options for retrofits, such as overflow parking areas or even the entire lot for porous pavement. Bioretention cells could be installed as median strips and/or convert current landscaped islands into the strormwater treatment cells.

Map reference Parking Lots #61, #62 and #63

Stormwater Retrofit – Large Parking Lots – EXAMPLE #3

PARK-N-FLY IN BROOKPARK AND THE COLLEDA SUBWATERSHED

The Park-N-Fly lot, located in Brookpark and the Colleda Subwatershed, contains over 11 acres of impervious cover. The lot appears not to have any stormwater management practices, contributing runoff to Big Creek. This is largely due to the time of development, which occurred prior to current stormwater regulations.

Options- This project area offers little in open areas that could be used to install retrofits. However, the perimeter landscaping around the parking lot offers opportunities. The lot is actively used, but the perimeter landscaping surrounding the lot can be used to install infiltration trenches or bioretention cells.

Priority Conservation / Restoration / Retrofits
Modify Existing Dry Basins

STORMWATER RETROFIT – MODIFY EXISTING DRY BASIN

The first place to look for retrofit storage is within existing ponds. Dry stormwater ponds are an extremely attractive retrofitting target. The most common approach is to enhance the current dry basin with new features to provide extended detention and wetland storage and habitat. Many of these basins can be retrofitted to improve water quality and quantity.

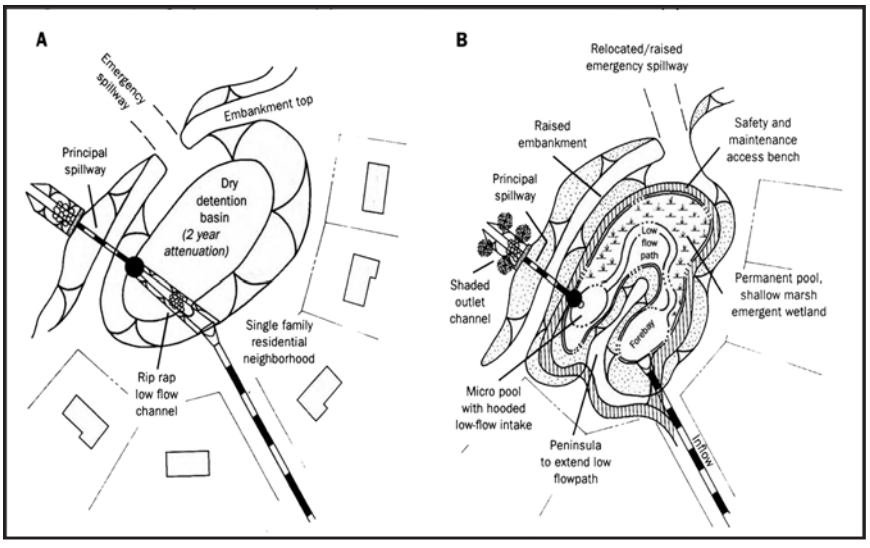
Dry basin retrofits are ideal since land costs are minimal, and construction costs are about 40% less than a new retrofit pond. In addition, since the land is already devoted to

stormwater management, most easements are already in place. Pond retrofits also need fewer permits and approvals compared to other storage retrofits. (CWP-Urban Subwatershed Restoration Manual 3)

Why do these basins need upgrading? Smaller, more frequent storm events that are typical to this region, degrade water quality, increase stream bank erosion and causes property damage. Most stormwater basins built in the past did little or nothing to reduce velocity or filter out pollutants from these smaller storms. Retrofitting existing dry basins can help alleviate these stormwater issues.

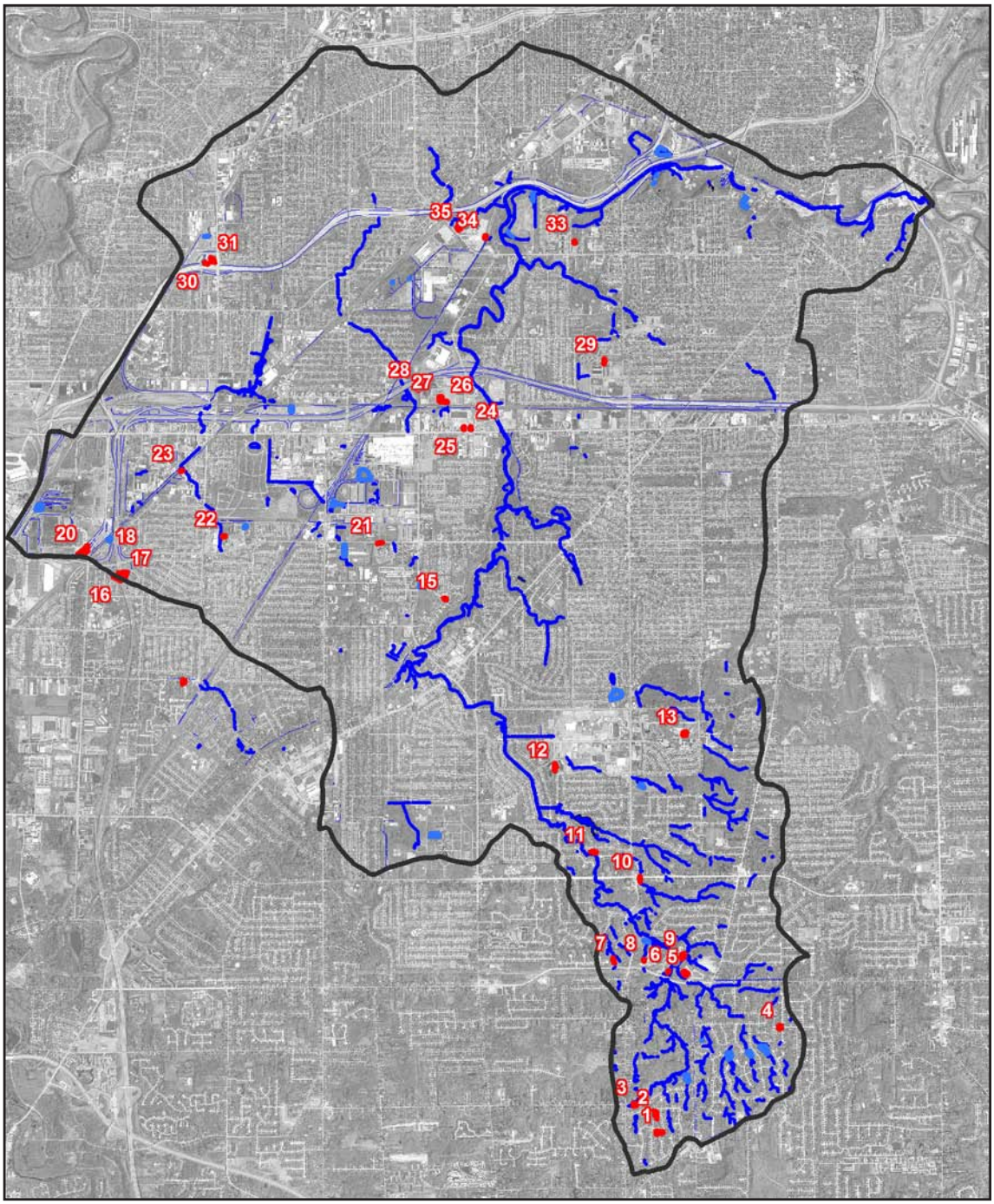
DRY BASIN RETROFIT STRATEGY

Retrofit Strategy	Descriptions
Upgrade Dry Basin to a Wetland Extended Detention Basin	These basins are similar to older stormwater basins in that they manage peak flows and flood control. Wetland extended detention basins, however, are equipped with extra stormwater features such as micropools and wetland habitat to improve the performance in treating the quantity and quality of stormwater.



Conversion of a dry pond to a wetland extended detention basin

Modify Existing Dry Basins



Stormwater Retrofit: Dry Basins

This map includes 35 dry stormwater detention basins. The sites are scattered throughout the entire watershed offering project sites in most subwatersheds. Some project sites may offer more opportunities than others through cost-effectiveness and measurable outcomes.

This is a planning level analysis; more details will *be needed for project implementation. These basins were identified through aerial photography and may not include all existing sites.*

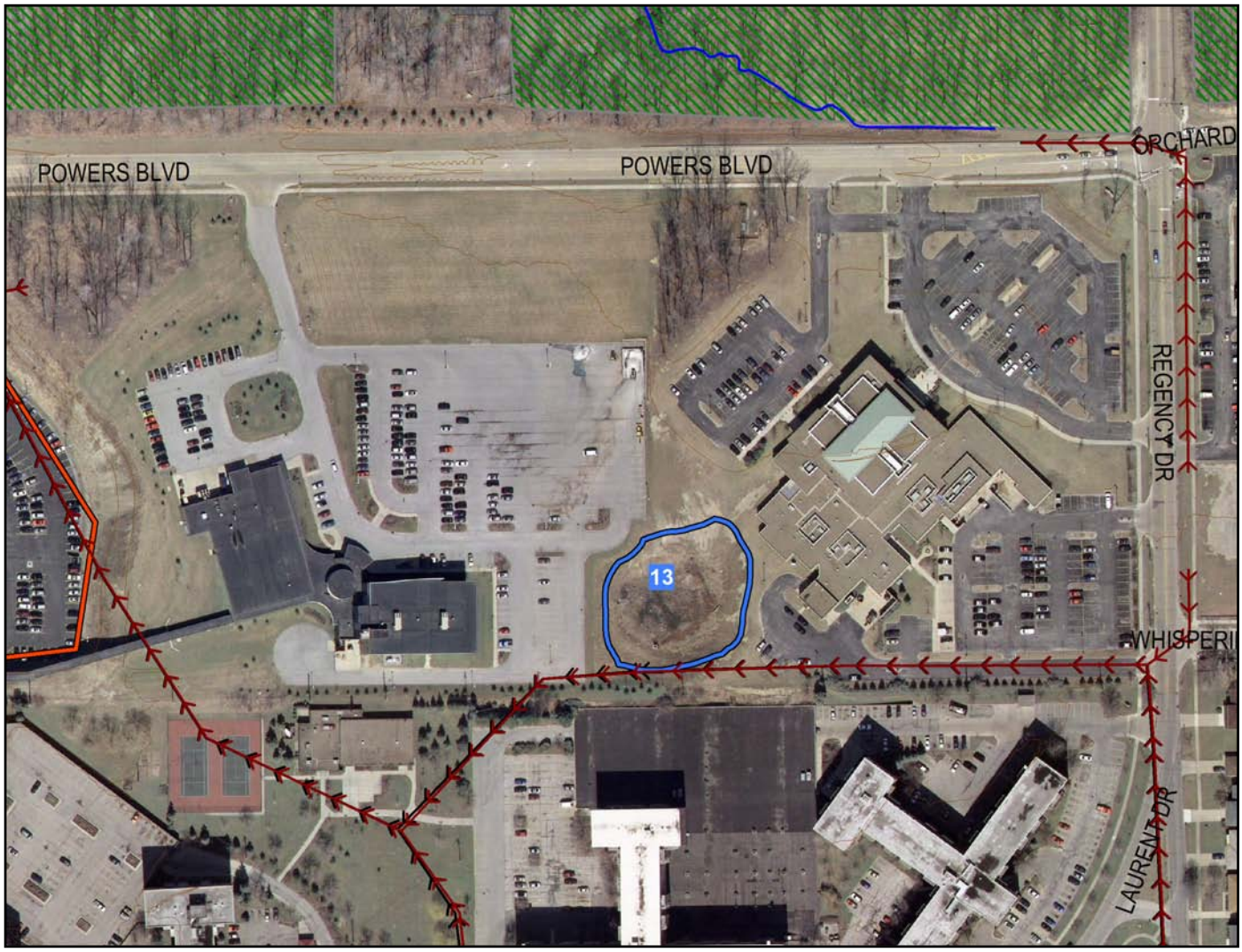
Priority Conservation / Restoration / Retrofits
Modify Existing Dry Basins

Stormwater Retrofit – Modify Existing Dry Basins – EXAMPLE #1

CITY OF PARMA DRY BASIN #12 IN UPPER BIG CREEK SUBWATERSHED

Basin #12 is located in the City of Parma and the Upper Big Creek Subwatershed near the intersection of Ames Rd. and Independence Blvd. The city of Parma is the owner, which provides an excellent opportunity to work on public land. This site is a dry basin with a concrete baseflow channel. Opportunities exist to upgrade this site into a wetland extended detention basin. Modifying this basin would improve stormwater capacity, water quality and neighborhood aesthetics. The modifications could include: excavate pond bottom, raise embankment, add or modify the riser, improve habitat and internal design geometry with a more meandering channel.

Stormwater Retrofit – Modify Existing Dry Basins – EXAMPLE #2

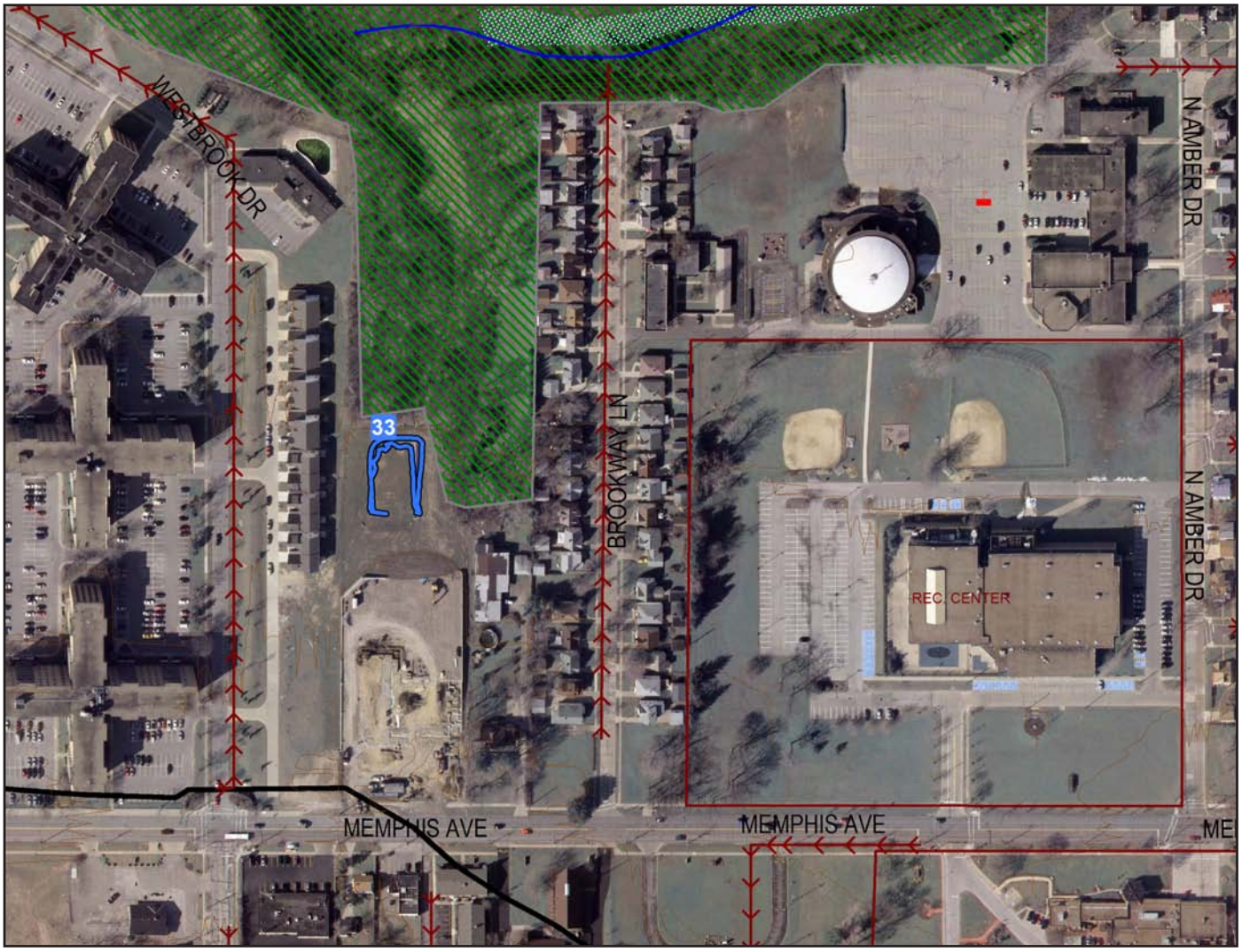


CITY OF PARMA DRY BASIN #13 IN EAST BRANCH SUBWATERSHED

Basin #13 is located in the city of Parma and the East Branch Subwatershed near Powers Blvd and Regency Dr. The city of Parma is the owner, which provides an excellent opportunity to work on public land. This site is a dry basin and offers opportunities to upgrade this site into a wetland extended detention basin. Modifying this basin would improve stormwater capacity, water quality and neighborhood aesthetics. The modifications could include: excavate pond bottom, raise embankment, add or modify the riser, improve habitat with native plantings.

Priority Conservation / Restoration / Retrofits
Modify Existing Dry Basins

Stormwater Retrofit – Modify Existing Dry Basins – EXAMPLE #3



CITY OF BROOKLYN DRY BASIN #33 IN LOWER BIG CREEK SUBWATERSHED

Basin #33 is located in the city of Brooklyn and the Lower Subwatershed near Memphis Ave. and Brookway Ln. The city of Brooklyn is the owner, which provides an excellent opportunity to work on public land. This site is a dry basin with a concrete baseflow channel. Opportunities exist to upgrade this site into a wetland extended detention basin. Modifying this basin would improve stormwater capacity, water quality and neighborhood aesthetics. The modifications could include: excavate pond bottom, raise embankment, add or modify the riser, improve habitat and internal design geometry with a more meandering channel.

STORMWATER RETROFIT – NEW STORAGE BELOW OUTFALLS

This stormwater retrofit creates new treatment adjacent to the stream corridor near the terminus of an existing storm drain outfall. This retrofit, when designed and located properly, can begin to improve the stormwater capacity of an urban watershed, such as Big Creek Outfall retrofits can occur at the terminus of an outfall or off-line by splitting flow from the existing storm drain pipe and diverting it to a stormwater treatment area formed by an existing depression or excavation.

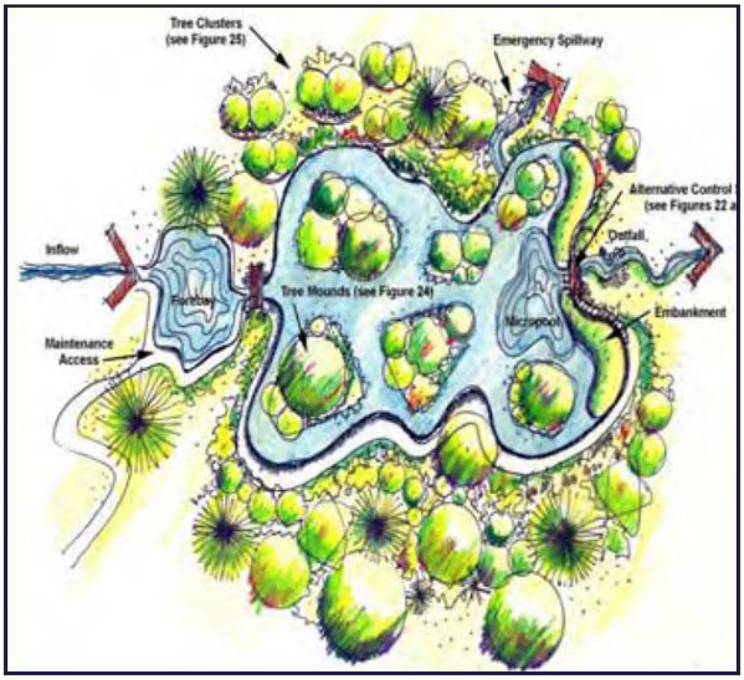
Typical stormwater treatment options at outfall retrofits are a combination of pocket wetland detention or bioretention cells. The placement of these practices are preferred at:

- Outfalls diameters of 12” to 36”
- A stream corridor in public ownership with enough openspace
- Enough pipe/channel gradient to divert flows for treatment and return them to the stream
- Manhole for the installation of a flow splitter.

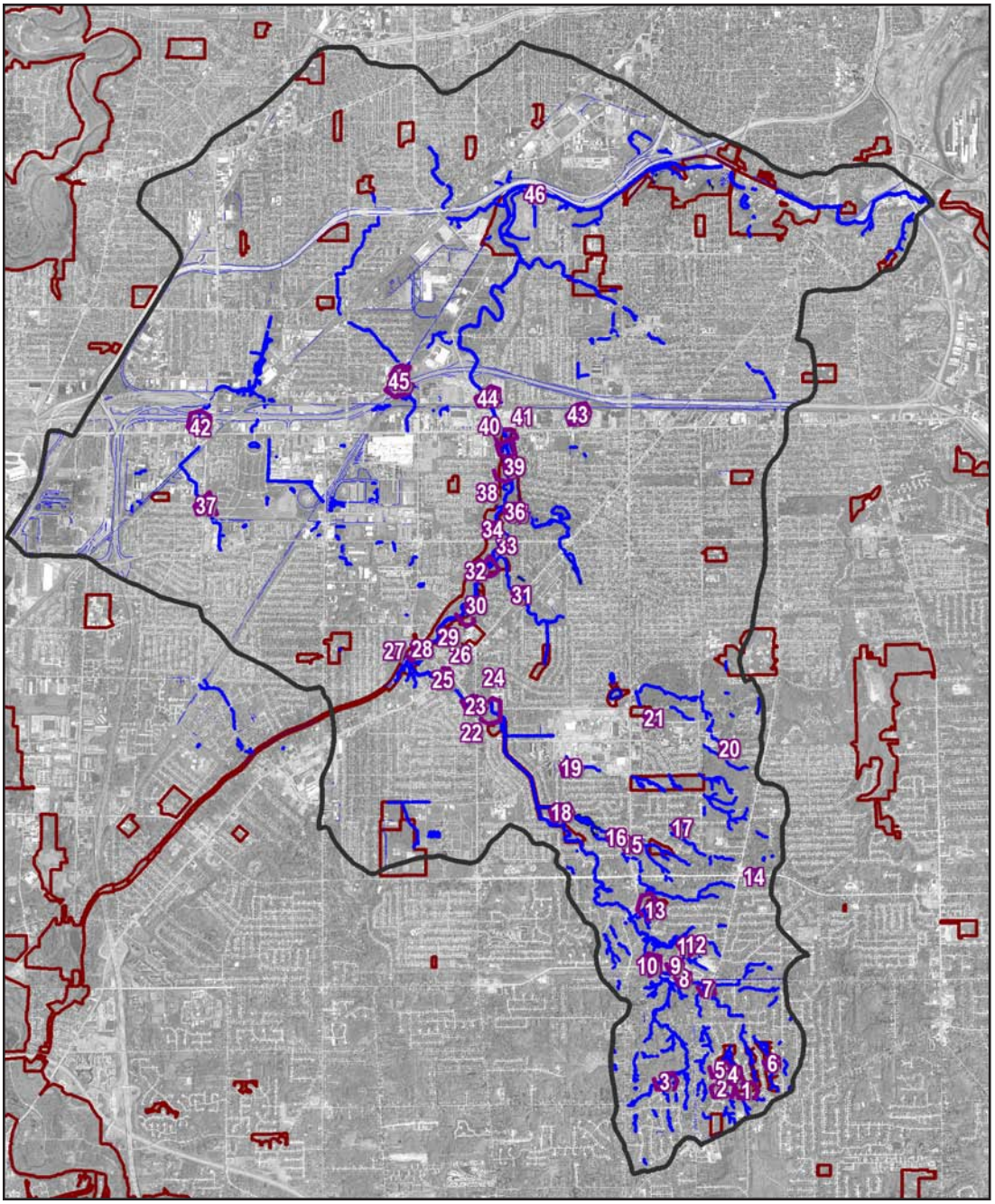
Outfall retrofits are ideal because they are close to the stream and maximize the upland drainage area treated. In addition, their offline location usually means fewer stream permitting problems. Lastly, outfall retrofits only need to be designed to provide the desired storage for water quality and/or channel protection; larger flood flows bypass the retrofit. (CWP-Urban Subwatershed Restoration Manual 3)

NEW STORAGE BELOW OUTFALLS RETROFIT STRATEGY

Retrofit Strategy	Descriptions
New Storage Below Outfalls	This strategy allows storage and treatment of stormwater at points where collected non-point pollution runoff exits the storm drain. Creating pocket wetlands or bioretention cells at select outfalls can help to improve a watershed’s stormwater capacity. Most communities have hundreds of outfalls which provide a number of opportunities to install this retrofit practice.



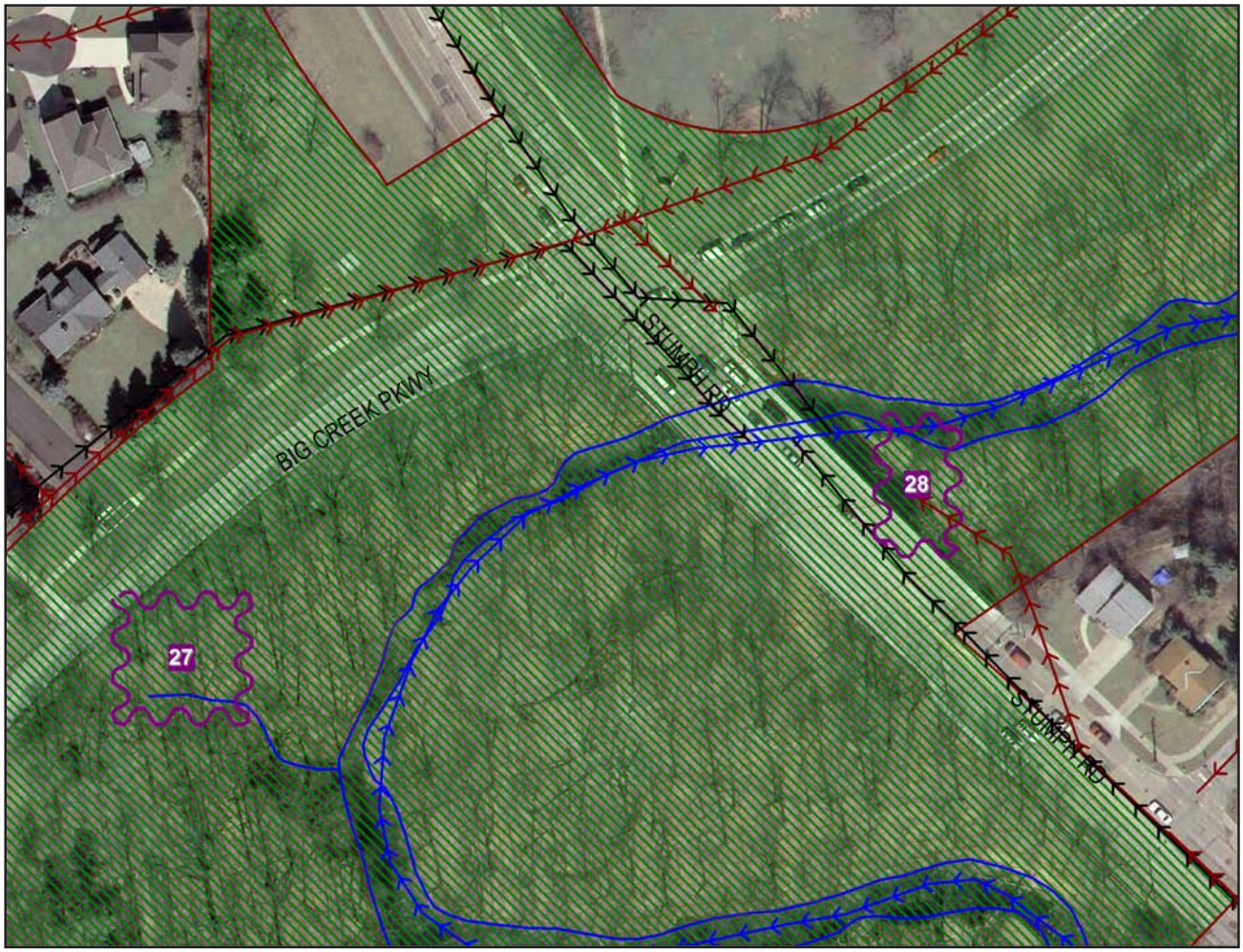
Priority Conservation / Restoration / Retrofits
New Storage Below Outfalls



STORMWATER RETROFIT: NEW STORAGE BELOW OUTFALLS

This map includes 46 outfall retrofit sites. There is a heavy concentration of project sites with the Big Creek Reservation and Upper subwatershed. The sites within the park system could provide excellent implementation and demonstration projects. Some sites may offer more opportunities than others in terms of cost-effectiveness, location and measurable outcomes. This is a planning level analysis; more details will be needed for project implementation. These sites were identified by outfall diameter, topography and nearby public property or openspace.

Stormwater Retrofit – New Storage Below Outfalls – EXAMPLE #1



OUTFALL 27 & 28 AT BIG CREEK RESERVATION

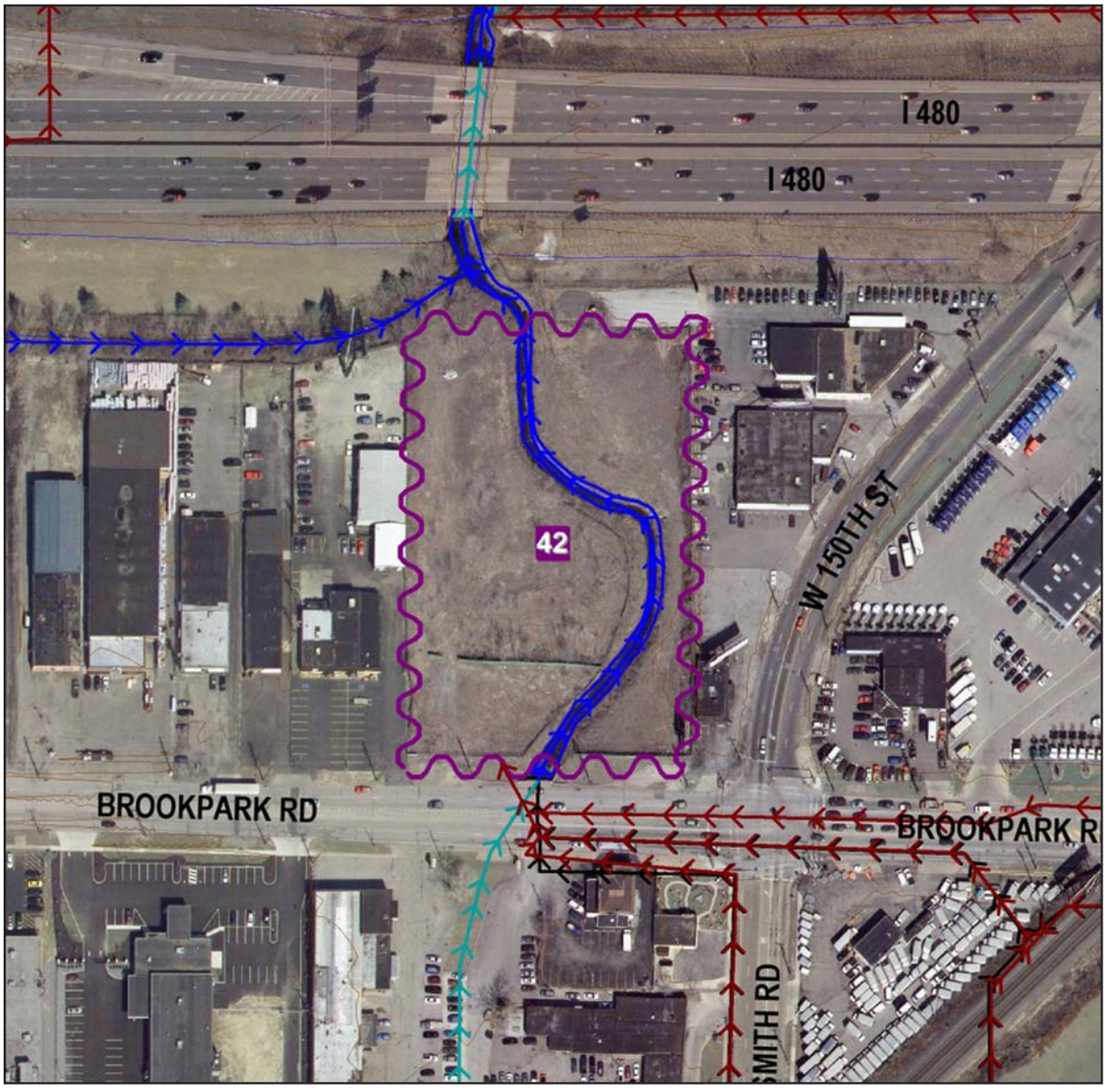
Sites #27 and #28 are 15” and 30” outfalls located in the city of Parma Heights and East Branch Subwatershed. The Cleveland Metroparks is the property owner, which provides an excellent opportunity to work on public land. The outfalls discharge runoff from the nearby road and neighborhood. The extent of the drainage area still needs to be assessed to determine type and size of retrofit practice.

Pocket wetlands or bioretention cells could be installed to help capture and treat some the stormwater runoff entering Big Creek. The NEORSD RIDE study identified flooding and erosion problems in this location. This could be an excellent project area and certainly warrants further investigation with the Metroparks, NEORSD and other stakeholders.

Priority Conservation / Restoration / Retrofits

New Storage Below Outfalls

Stormwater Retrofit – New Storage Below Outfalls – EXAMPLE #2



OUTFALL 42 AT BROOKPARK AND SMITH ROADS

Site #42 is a 24” outfall located on vacant, private property in the city of Brookpark and Colleda subwatershed. The area contains 3.5 acre parcel, zoned commercial and surrounds an open stream channel. The outfall discharges runoff from the nearby road and neighborhood. The extent of the drainage area still needs to be assessed to determine type and size of retrofit practice.

Pocket wetlands or bioretention cells could be installed to help capture and treat some the stormwater runoff entering Big Creek. The NEORSD RIDE study identified intercommunity flooding and erosion problems in this location. This could be a good project area and certainly warrants further investigation with the Brookpark, NEORSD, landowner and other stakeholders.

Stormwater Retrofit – New Storage Below Outfalls – EXAMPLE #3

OUTFALLS 40 & 41 AT BIG CREEK RESERVATION

Sites #40 and #41 are both 36”outfalls located near the boarder of Parma and Brooklyn and East Branch Subwatershed. The Cleveland Metroparks is the property owner, which provides an excellent opportunity to work on public land. The outfall discharges runoff from the nearby road and neighborhood. The extent of the drainage area still needs to be assessed to determine type and size of retrofit practice.

Pocket wetlands or bioretention cells could be installed to help capture and treat some the stormwater runoff entering Big Creek. The NEORSD RIDE study identified intercommunity flooding and erosion problems in this location. This could be an excellent project area and certainly warrants further investigation with the Metroparks, NEORSD, cities and other stakeholders.

Priority Conservation / Restoration / Retrofits

Storage at Highway Interchanges

STORMWATER RETROFIT – STORAGE AT HIGHWAY INTERCHANGES

Highways often contain open and under-used land within their right-of-way where stormwater storage can be obtained by diverting highway runoff into these areas. The most common stormwater treatment options for highway retrofits constructed wetlands or linear bioretention and swales along wider medians and rights-of-way. These options can help to increase the stormwater capacity of an urban Big Creek watershed.

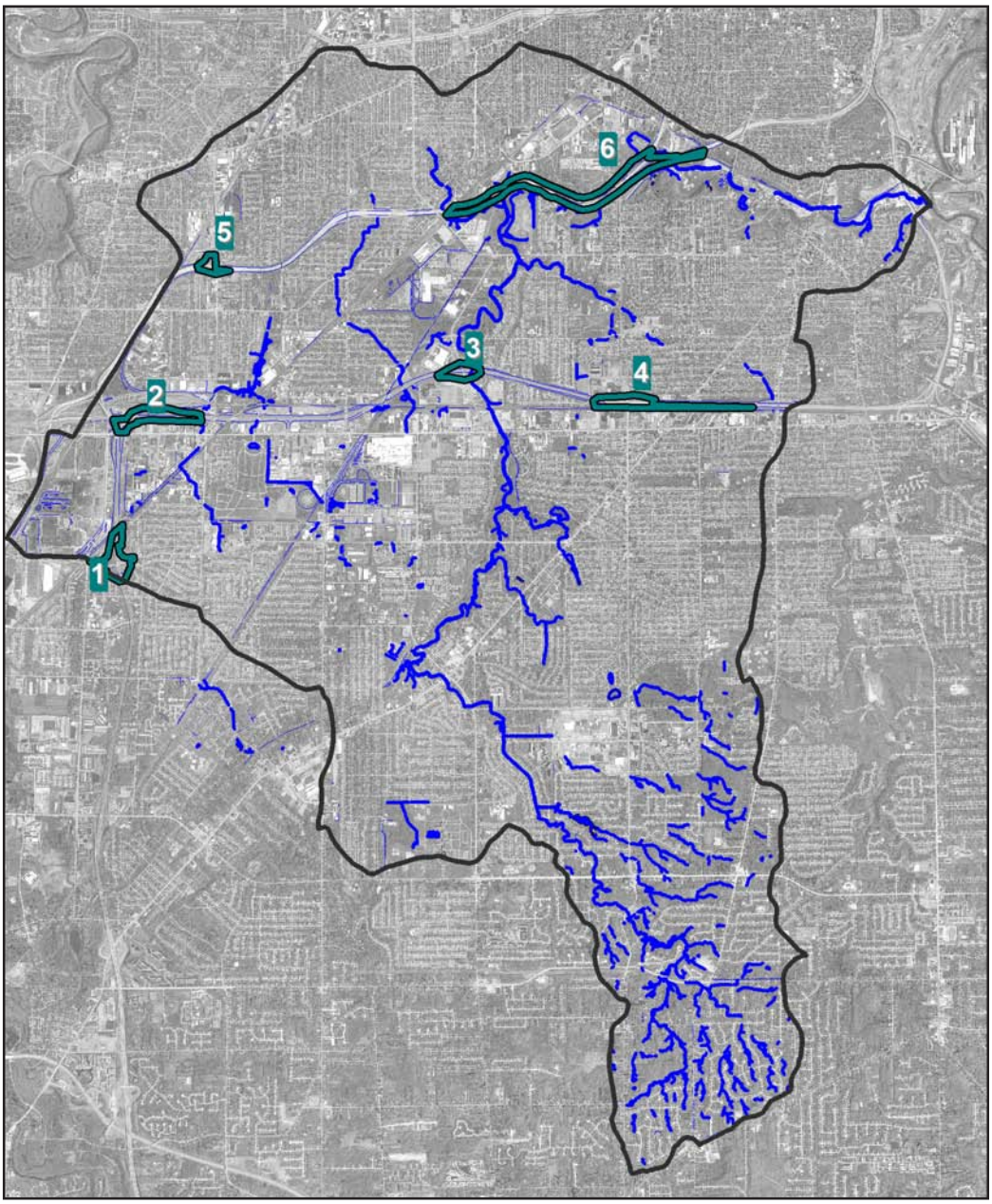
Highway retrofits are ideal because their runoff pollutant concentration is high. Land costs are relatively low since the retrofit is located in a public right of way. The Ohio Department of Transportation (ODOT) would be a good partner, as ODOT and other agencies have to comply with stormwater permit requirements and watershed mitigation.

Lastly, highway agencies are often “good maintainers” and may see retrofits as a means of reducing their ongoing maintenance operations. (CWP-Urban Subwatershed Restoration Manual 3)

HIGHWAY INTERCHANGE RETROFIT STRATEGIES

RETROFIT STRATEGY	DESCRIPTIONS
Wetland Extended Detention	These basins are similar to stormwater basins in that the manage peak flows and flood control. Wetland basins however, are equipped with extra stormwater features such as micropools and wetland habitat to improve the performance in treating the quantity and quality of stormwater.
Linear Bioretention Cells & Swales	Bioretention cells are landscape features adapted to treat runoff. Runoff is directed and treated to a filter bed similar to a forest floor. Linear biorention cells can be placed in medians and right-of-ways where feasible.

Storage at Highway Interchanges

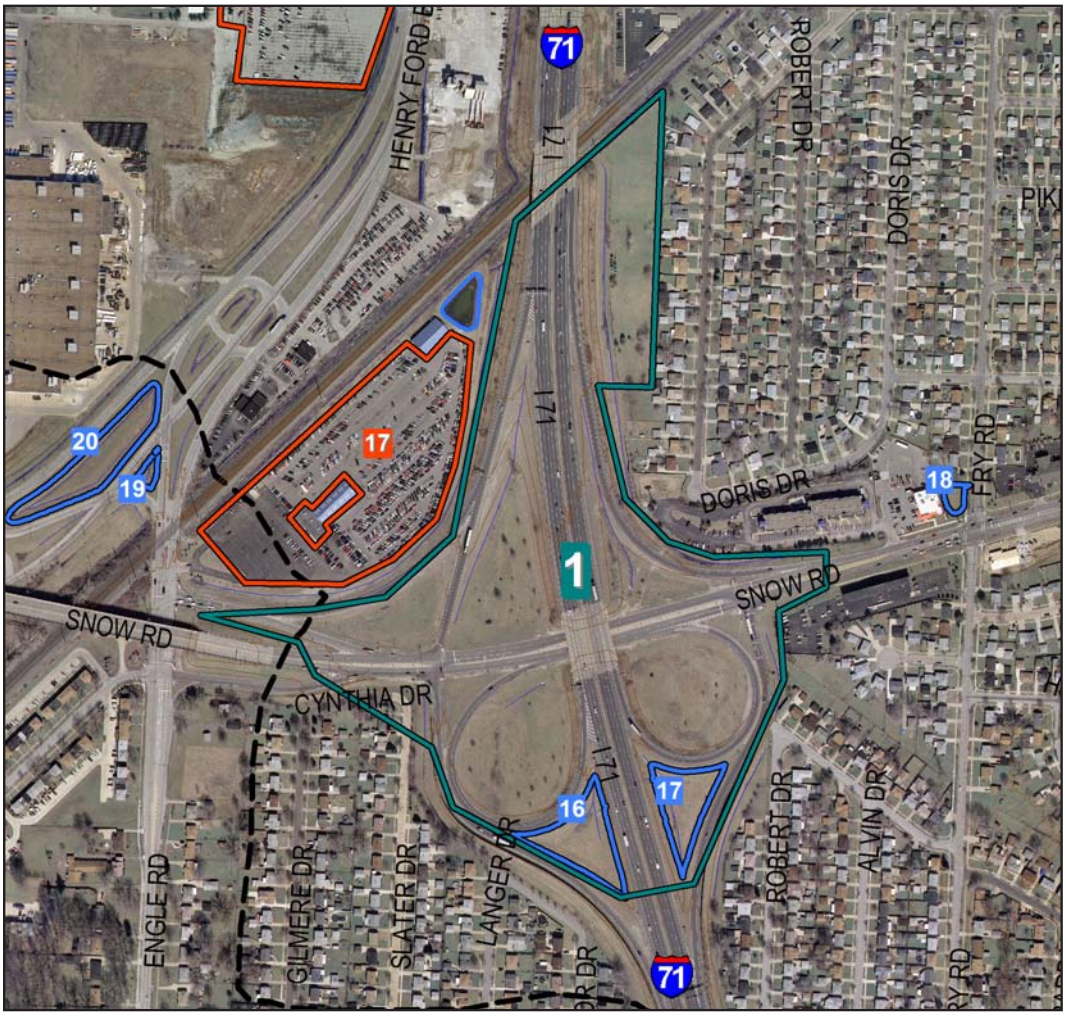


POTENTIAL HIGHWAY INTERCHANGE STORAGE SITES

This map includes six project areas around Interstates 480 and 71. The cloverleaf interchanges and wide medians and right-of-ways offer excellent retrofit areas. Some project sites may offer more opportunities than others through cost-effectiveness, location and measurable outcomes. Selecting project location should coincide with areas in need of immediate flooding and erosion reduction. This is a planning level analysis; more details will be needed for project implementation

Priority Conservation / Restoration / Retrofits
Storage at Highway Interchanges

Stormwater Retrofit – New Storage Below Outfalls – EXAMPLE #1



Highway Interchange #1 at I-71 & Snow Road

Site #1 is located in the city of Brookpark and the Colleda subwatershed. The Colleda basin is the most urbanized subwatershed and could greatly benefit from stormwater retrofits. The interchange at Interstate 71 and Snow road includes large cloverleaf interchanges, right-of-ways, highway buffers and includes dry basins #16 and 17.

Stormwater storage and improved water quality can be obtained by diverting highway runoff into these areas. Creating wetland detention basins or other best management practice could help to increase the stormwater capacity in the Colleda Branch and potentially begin to address nearby stormwater flooding and erosion problems identified in the RIDE Study.

Strategies for implementation would be best pursued through multi-stakeholder cooperation and integrating this project into a larger municipal or state construction project. Also, explore directing compensatory wetland or stream mitigation that ODOT may be required to conduct in the future

Storage at Highway Interchanges

Stormwater Retrofit – New Storage Below Outfalls – EXAMPLE #2

Highway Interchange #3 at I-480 & Tiedeman Road

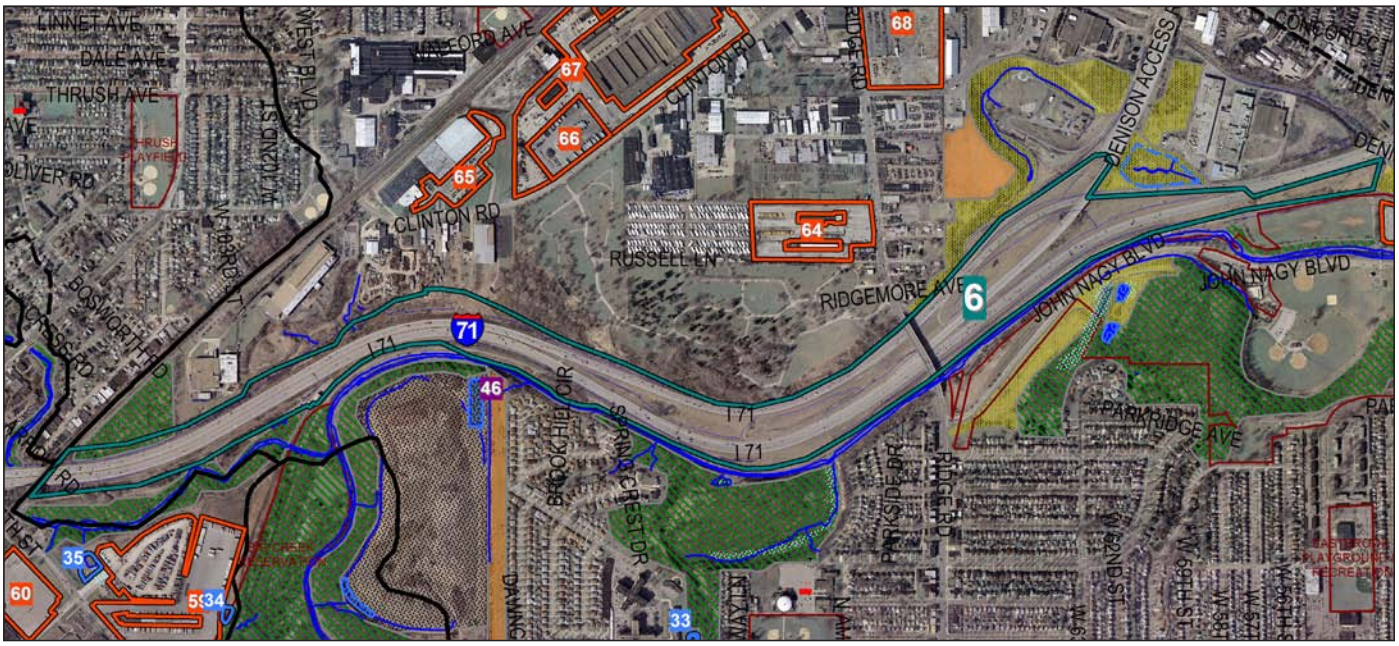
Site # 3 is located in the city of Brooklyn and the East Branch subwatershed. The East basin contains approximately 32% impervious coverage and could greatly benefit from stormwater retrofits. The interchange at Interstate 480 and Tiedeman road includes large interchanges and highway buffers. This area is nearby Large Tract 54 and is also in the vicinity of the proposed greenway trail system.

Stormwater storage and improved water quality can be obtained by diverting highway runoff into these areas. Creating wetland detention basins or other best management practice could help to increase the stormwater capacity in the East Branch and potentially begin to address nearby stormwater flooding and erosion problems identified the RIDE study.

Strategies for implementation would be best pursued through multi-stakeholder cooperation and integrating this project into a larger municipal or state construction project. Also, explore directing compensatory wetland or stream mitigation that ODOT may be required to conduct in the future

Priority Conservation / Restoration / Retrofits
Storage at Highway Interchanges

Stormwater Retrofit – New Storage Below Outfalls – EXAMPLE #3



HIGHWAY MEDIAN AND INTERCHANGE #6 AT I-71 & DENISON ACCESS

Site #6 in the city of Cleveland and Brooklyn and the Lower Big Creek subwatershed. The lower basin contains approximately 41% impervious coverage and could greatly benefit from stormwater retrofits. The I-71 and Denison areas includes large interchanges, medians and highway buffers.

Stormwater storage and improved water quality can be obtained by diverting highway runoff into these areas. Creating wetland detention basins or other best management practice could help to increase the stormwater capacity in the Lower subwatershed and potentially begin to address nearby stormwater flooding and erosion problems identified the RIDE study.

Strategies for implementation would be best pursued through multi-stakeholder cooperation and integrating this project into a larger municipal or state construction project. Also, explore directing compensatory wetland or stream mitigation that ODOT may be required to conduct in the future.

STRATEGIES	DETAILS	POTENTIAL FUNDING SOURCES
Demonstration Projects	Demonstration projects (ex. stream restoration) tend to serve only a small portion of a watershed, but they are an excellent early action projects and are useful educational purposes.	Foundations; Local Community; ODNR Coastal Management; ODNR Coastal and Estuarine Land Conservation Program; National Fish and Wildlife 5 Star; National Fish & Wildlife Keystone Initiative; OEPA 319 Implementation; Lake Erie Protection Fund; Great Lakes Watershed Restoration Grant; Clean Ohio Grants; Northeast Ohio Regional Sewer District's Stormwater Utility
Projects on Public Land	Projects on public land can be located in stream valleys, parks, public rights-of-way and publicly-owned stormwater infrastructure. Public land projects are easier to deliver because they do not require land acquisition.	Foundations; Local Community; ODNR Coastal Management; ODNR Coastal and Estuarine Land Conservation Program; National Fish and Wildlife 5 Star; National Fish and Wildlife Keystone Initiative; OEPA 319 Implementation; Lake Erie Protection Fund; Great Lakes Watershed Restoration Grant; Clean Ohio Grants; Northeast Ohio Regional Sewer District's Stormwater Utility
Projects on Private Property & Neighborhoods	Projects on private property could include low cost on-site residential retrofits such as rain barrels or infiltration practices like a bioretention cell or rain garden. This requires effective education to homeowners to persuade them to install such practices.	Land Owner; Foundations; Local Community; Ohio EPA (Ohio Environmental Education Fund OEEF)
Incorporate Projects into Larger Municipal Construction Project	Restoration or preservation projects can be incorporated into larger municipal construction capital projects, such as streetscape improvements, transportation projects, school construction, sewer line and drainage improvements.	Local Community State and/or County Agency Northeast Ohio Regional Sewer District's Stormwater Utility
Direct Compensatory Mitigation to Big Creek	This method of implementing preservation, restoration and retrofit projects requires good communication and outreach. These projects could be funded by developers, agencies or others that are seeking opportunities to meet offsite environmental mitigation needs.	Land Owner, Developer, Local Community, Utility
Stormwater Treatment for New and Redevelopment Projects	This method requires timely communication and sharing of new practices and strategies during planning and council meetings. Due to new NPDES stormwater Phase II rules all new or redevelopment must meet certain water quality standards. This is an opportunity to ensure projects incorporate new, effective and cost efficient stormwater practices.	Land Owner, Developer, Local Community,