

EROSION MANAGEMENT PLAN FOR THE BLACK RIVER CORRIDOR



GYMO

ARCHITECTURE, ENGINEERING & LAND SURVEYING, P.C.

This document was prepared for the New York State Department of State Office of Coastal, Local Government and Community Sustainability with funds provided under Title 11 of the Environmental Protection Fund.

EROSION MANAGEMENT PLAN
TABLE OF CONTENTS

PAGE NUMBERS

I.	<u>BACKGROUND INFORMATION</u>	
A.	GENERAL	1
B.	PROJECT DESCRIPTION	1
C.	EROSION	2
D.	METHODOLOGY	3
E.	GEOLOGY AND SOILS	4
F.	EROSION CONTROL MEASURES	5
G.	FOCUS AREAS	7
H.	ATTACHMENTS	8
II.	<u>RIVER INSPECTION AND ANALYSIS</u>	
A.	GENERAL	9
B.	PAST EXPERIENCE AND HISTORY	9
C.	SUB CORRIDOR OBSERVATION AREAS	12
D.	CRITICAL VANTAGE POINTS	92
III.	<u>RECOMMENDED ACTIONS</u>	
A.	CATEGORIZED EROSION AREAS	101
B.	INSPECTION PROGRAMS	102
C.	EROSION EDUCATION	103
D.	RIVER REGULATIONS	104
E.	DESIGN STANDARDS	104
F.	PREVENTATIVE AND EMERGENCY MEASURES	105
IV.	<u>CONCLUSION</u>	

APPENDICES

APPENDIX A – OVERALL MAP 1

APPENDIX B – LWRP MAPPING

APPENDIX C – SOILS INFORMATION AND MAPPING

APPENDIX D – EROSION CONTROL INFORMATION

- NYSDEC STANDARDS FOR EROSION AND SEDIMENT CONTROL STRUCTURAL STREAMBANK PROTECTION METHODS
- NYSDEC STANDARDS FOR EROSION AND SEDIMENT CONTROL TABLE 3.6 MAXIMUM PERMISSIBLE VELOCITIES FOR SELECTED SEED MIXTURES
- NYSDEC STANDARDS FOR EROSION AND SEDIMENT CONTROL TABLE 3.3 TREES SUITABLE FOR LANDSCAPE AND CONSERVATION PLANTINGS IN NEW YORK
- NYSDOT BANK AND CHANNEL PROTECTIVE LINING DESIGN PROCEDURES

APPENDIX E – 1993 STORM EVENT PHOTOS/NEWSPAPER ARTICLES/RIVER FLOW STATISTICS

APPENDIX F – “EROSION ON THE NORTH SHORE ROUTE 3 ACCESS” FIELD REPORT BY MR. NORMAN WAYTE

APPENDIX G – BICENTENNIAL PARK/MARBLE STREET PARK IMPROVEMENT PLANS
HOLE BROTHERS PARK PLANS
FUTURE WATERFRONT TRAIL SYSTEM PLANS

APPENDIX H – SAMPLE RESIDENT EROSION MANAGEMENT GUIDES

APPENDIX I – SAMPLE MUNICIPAL RIVER CODES

This document was prepared for the New York State Department of State Office of Coastal, Local Government and Community Sustainability with funds provided under Title 11 of the Environmental Protection Fund.

I. BACKGROUND INFORMATION

A. GENERAL

New York's Black River ("the river") originates in the foothills of the Adirondack Mountains and eventually discharges into Lake Ontario. From the early industrial days when the City of Watertown was first settled in the early 1800's and the settlers used the river to power industry into the 20th century to the present condition where the river is the center of business and recreational activities, the river has proved to be the backbone of the City of Watertown as it has progressed throughout its history.

The river continues to flow through the City of Watertown to this day, serving it with drinking water, electricity, and entertainment. The project site will consist of the Black River Corridor ("the corridor), which stretches from Interstate 81 to the west, through the middle of the City of Watertown to Huntington Island, approximately 5 miles away to the east as shown on the Overall Map 1 included in Appendix A. The river changes dramatically from one end of the corridor to the other. It varies from fast moving narrow sections used for white water rafting, to wide, beautiful calm sections which can be used for canoeing and kayaking.

B. PROJECT DESCRIPTION

Along with the benefits of having the Black River within the City limits come the responsibilities. GYMO, Architecture, Engineering, and Land Surveying, P.C. has been retained by the City of Watertown to prepare this Erosion Management Plan (EMP). It will serve to guide those who are planning to develop and/or maintain areas along the riverbanks in preventing or minimizing erosion within the limits as shown on the Local Waterfront Revitalization Program (LWRP) Black River Corridor map in Appendix B.

The Black River Erosion Management Plan is designed to identify areas susceptible to and undergoing erosion. These identified areas will be analyzed and a general solution to the problem will be recommended. While the EMP will attempt to generally address erosion areas within the entire project limits, existing and proposed river access areas will be focused on which are of higher importance.

Once the EMP plan is accepted and in place, it should be treated as an ever changing, dynamic document, much like the river is. As time goes by, the river will undoubtedly change, and the corresponding EMP should as well. This plan should be revisited periodically to be updated with current: technology, development plans, projects that have been built, areas of concern, etc. Furthermore, this document should not be viewed as an end all solution to the erosion problems of the river; it should rather be looked at as an overall picture of the Black River Corridor which can be used as a foundation for further analysis of the river and as a tool to identify areas to concentrate on for improvement as funds become available for development.

It should be noted that the recommendations made in this report are general in nature and if specific improvements are to be made to prevent erosion in certain areas, more specific plans should be developed. To accurately determine types of erosion control truly required in most areas, additional inspections and calculations are required and should be performed.

C. EROSION

1. Erosion Types

Before attempting to mitigate erosion within the river areas, it is important to understand the definition of erosion and its different types. According to the New York State Stormwater Management Design Manual, erosion is the wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. Several types of erosion exist and are listed and defined below:

A) Accelerated Erosion

Erosion much more rapid than normal, natural or geologic erosion, primarily as a result of the activities of man or, in some cases of other animals or natural catastrophes that expose base surfaces.

B) Gully Erosion

The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 1 or 2 feet to as much as 75 to 100 feet.

C) Rill Erosion

An erosion process in which numerous small channels only several inches deep are formed.

D) Sheet Erosion

The spattering of small soil particles caused by the impact of raindrops on wet soils. The loosened and spattered particles may or may not subsequently be removed by surface runoff.

2. Causes of Erosion

Within the defined LWRP boundaries, the Black River adopts several different levels of seasonal flow, with varying widths and depths causing for unique erosion issues. The Black River within the City of Watertown is also surrounded mostly by impervious surfaces, causing much higher runoff discharges into the river than would have normally resulted from undeveloped conditions. This increased amount of runoff is generally conveyed to the river through storm piping and outfalls along the banks. These outfalls can contribute to erosion in some cases if the outlets are not stabilized properly.

In most of the downtown area of the City of Watertown, the banks are very steep and the river is narrow. The small area for water to flow forces the water to have much more velocity and energy, causing potential for significant erosion. Other areas of the river, such as the Eastern Islands area are much wider and allow the same flow to move through the area at a slower velocity.

Velocity does have a significant effect on the potential for erosion, but it is not the only variable which should be considered. Bank materials and slope conditions also effect erosion. Bank materials vary from very susceptible to very resistant to erosion. For example, the limestone bedrock on a majority of the lower banks along the river is far less likely to be eroded, while sandy shores like those in the Eastern Islands area could be at a great risk of suffering erosion. The slope at which the materials in the banks are configured at also effects the potential for erosion. A steep bank of most any material would likely erode away faster than a gently sloping area of the same material.

Another source of erosion which can be significant if conditions are right is from ice. During the spring when the ice melts and breaks up in more slowly moving areas of the river, ice jams can form downstream which cause significant erosion at times. Even lone pieces of ice flowing down the river can cause erosion. Since the Black River in the study area tends to be quick moving, ice does not get many opportunities to form in a calm area. Some ice does develop in the Eastern Islands Area, but hasn't been found to cause significant ice damage in the past. Although, ice erosion should still be considered as a possibility due to the cold climate and changing seasons that this area experiences.

3. Current Erosion

The Black River area within the LWRP boundaries is subject to all of the different types of erosion at one time or another, but most erosion is of the accelerated type. Rill and sheet erosion do take place, just not as often as accelerated erosion. Gully erosion is not common along the river in this area.

In general the Black River within the LWRP boundaries is known to flow on and through limestone bedrock. This bedrock does not see much in the form of erosion. There are areas where the limestone rock is breaking apart and falling into the river, such as near the Route 3 Wave, but in general the soils that are on top of the bedrock are what tend to erode away when the water levels are high enough. Many retaining structures have been built along the river to prevent erosion. Some of these aging structures are in poor condition and are eroding away themselves.

Many structures in the downtown area have been built right along the river. These buildings close to the river are at a greater risk of being eroded than buildings farther away. Structures such as buildings and bridges very close or on the bank of the river can be undermined and become structurally unstable. Structures like this which have visual evidence will be pointed out for reference.

Throughout the city are many outfalls from the developments that have been built over the years. Other outfalls exist from tributaries such as Kelsey Creek. These outfalls pose increased risks for erosion at their locations. In general, many of these outfalls discharge onto limestone bedrock which limits the potential for erosion. Outfalls were inspected for erosion and are discussed in latter sections of this report.

D. METHODOLOGY

1. Inspections

The main method for gathering information on eroded areas and erosion susceptible areas was via field inspection. The majority of the corridor was walked along the bank, canoed, or kayaked. This made for a close up, hands on examination of the river. It also helped in finding areas of erosion that might have gone unnoticed in areas of the river which are visited infrequently. Select areas which were hazardous to access were observed from a distance. Additionally, existing access points and areas to be potentially developed along the river were inspected. These existing access points included river boat launches, walking trails, and scenic venues. Future areas of development were also focused on in this study.

It is important to understand that the recommendations made in this report are based strictly off visual inspections. Visual inspections provide valuable insight into erosion problems, but are not all that should be used to evaluate situations. Larger structures, such as bridges and dams may appear to be stable based on visual inspections, but it will likely take more thorough structural inspections and testing to determine if this is the case. For this reason, larger structures will have obvious erosion related deficiencies pointed out only for reference. Additional inspections and testing will have to be relied

upon to determine the condition of these types of structures. The inspection of these structures performed in looking for evidence of erosion should be considered as a supplement to the periodic inspections that already should be taking place on them. Furthermore, abandoned structures will be included in the river inspections as they are often the ones that have the most potential for failure due to absence of maintenance.

2. Erosion Control Selection

Many erosion control methods are considered for this EMP and will be discussed in the erosion control section of this report. The main driving force in the method determination for the river is flow velocity or the speed that the water is traveling at. Lower flow velocities can be mitigated through the use of the vegetative measures while the higher erosive velocities many times require more permanent and substantial measures such as rip rap or retaining walls. Combinations of the two types of erosion control can also be employed. Erosion control measures are discussed in section I.F.

3. River History

Another factor when considering what erosion control devices to utilize and where is past experience that others have had with controlling erosion. It is obvious to see when inspecting the river that many different types of erosion control measures have been utilized. Retaining walls, rip rap and vegetation all exists along the banks of the river. As part of this project, appropriate agencies have been contacted to find what controls have worked effectively in the past.

Sometimes the best way to predict the future is to look into the past. The past history of erosion problems can also be used to help assist in finding areas which may be in need of erosion controls. This will be done for this project through researching newspapers and other resources to find specific areas of the river that have eroded away in the past.

4. Targeted Storm Event

Although the corridor being analyzed in this EMP is fairly large, it is small compared to the drainage area which contributes the flow. With a drainage area of approximately 1,916 square miles, the resulting flows can be very significant. At times throughout the history of this river, it has crested at dangerously high levels. On 10 January 1998, as part of the Ice Storm and resulting flood, the river crested at 16.0 feet in Watertown and peaked at 55,500 cubic feet per second (CFS). This was determined to be more than a 100 year interval storm event, meaning that the chance of that storm occurring of that magnitude in any given year is one in one hundred. As we have seen these very high levels in recent history, this report is going to assume erosion controls will need to be designed for over a 100 year interval storm event.

The entire banks will be considered for erosion controls where mapping shows the 100 year flood plain shows outside of the river area. Flood Plain mapping was provided as part of the LWRP plan. A copy of this mapping is included in Appendix B.

E. GEOLOGY AND SOILS

According to the LWRP Plan, the Black River is under laid and surrounded in some areas by limestone bedrock. This is visible in many areas of the river. As previously mentioned, this bedrock is very resistant to erosion and in general, the materials that lay on top of the bedrock are what erode away. The United States Department of Agriculture's Natural Resources Conservations Service has been utilized to determine the types of soils existing along the banks of the river. Attached in Appendix C is a "Custom Soil Resource Report for Jefferson County, New York – Black River Banks within LWRP Boundary" which documents the soils in moderate detail. In all, 28 separate

soil types were found; excluding the water listing that is included in the report. The most common soil types along the banks of the river besides the classified urban land were: Farmington Loam, Agawam fine sandy loams, Collamer silt loams, and Niagara Silt Loams. Loams generally consist of sand, silt, clay and organic matter. Simply put, the soils above the bedrock which are generally along the banks of the river are susceptible to erosion, if not properly held in place with erosion controls. In most areas, the natural vegetation along the riverbanks holds this material in place quite well. Areas of higher velocity have shown evidence of washing out. These are the types of areas where structural erosion controls would be considered and will be discussed in this report.

F. EROSION CONTROL MEASURES

There are many types of erosion control, including vegetative, structural and combinations of the two. Even within each type of erosion control there are several options. Viable options for the river within the LWRP boundaries will be considered and discussed in this section.

1. Vegetative Measures for Erosion Controls

The natural and preferred method of erosion control is through the use of vegetation. The Black River's banks are naturally protected by vegetation that grows along the banks. Trees, brush and grass grow in many areas and effectively keep bank materials from eroding away with their root systems. Frequently, human activities such as pedestrians walking along the banks, construction or cutting down trees for views can inadvertently make an area more susceptible to erosion. Once the erosive resistance of these areas has been weakened, the erosive forces can eat away at the material in the banks and cause washouts. Some of these areas that have been weakened can be re-vegetated and returned to original conditions. Some vegetative methods of erosion control are: proper planting of new vegetation, mulching, stabilization with sod and protection of existing vegetation. In general the vegetation of banks involves a lot of common sense. Common sense plays a big role in determining whether or not vegetation will establish itself after it has been planted.

A) Timing

Simple things such as the time of year that vegetation is planted impact its survival. It is common for construction sites to work as long as they can into the Fall until the weather becomes too problematic to work with. It is at this time when contractors might try to leave for the winter. At this point it is too late to establish vegetation. Proper planning when dealing with these construction sites and planting in general is required.

B) Soil Conditions

Soil conditions can have a great effect on the success of planting vegetative erosion controls. Without the right pH levels, plantings will die off. It may be necessary to fertilize the soils in the area to provide this correct pH level. If slopes of the bank are too steep, some vegetation may not be able to establish itself. If a bank can be graded out to be more gently sloping, it may help vegetation to take hold in the area.

The level of compaction of soil will also effect the establishment of vegetation in an area. It may be necessary to loosen soil in an area before planting. Another thing to consider when planting is what is going to hold the new seeds or plants in place while they are becoming established. It is common to provide mulch around plantings in case wind or other sources of erosion come along. Other common practices are seeding, then tracking or fastening to the ground. This also provides more resistance

to erosion during the establishment phase.

C) Species Selection

There are thousands of species of plants to pick from when trying to re-establish vegetation. It is important to select appropriate types of species that will thrive in the area. Native species are more likely to survive as they have proven themselves in the area. Included as part of Appendix D are tables from the New York State Department of Environmental Conservation's (NYSDEC) New York State Standards and Specifications for Erosion and Sediment Control which help in selecting appropriate seed mixes for erosive areas as well as trees and shrubs for other areas.

2. Structural Measures for Erosion Controls

Some areas have rapidly moving water velocities which carry too much energy for vegetative measures to dissipate. In these cases it becomes necessary to install more significant energy dissipating structures. These structural erosion controls generally require site specific engineering to be performed to determine the size, configuration, etc. Structural measures for erosion control that will be considered for the Black River within the LWRP boundaries are: geogrid reinforced vegetation, rip rap, concrete structures, grid pavers, interlocking modular pre-cast concrete units and other combinations of the previously mentioned. These are the ones that were deemed as most appropriate for erosion control in the Black River within the LWRP boundaries. Additional methods other than what will be called out in this section do exist. Included as part of Appendix D is information on erosion control measures and their construction. A "Bank and Channel Protective Lining Design Procedures" manual issued by the New York State Department of Transportation (NYSDOT) has been provided in addition to NYSDEC's Structural Streambank Protection Examples.

A) Geogrid Reinforced Vegetation

In some cases where vegetation alone cannot handle the erosive forces in an area, structural reinforcement can be included with the vegetation to keep it in place. Several companies carry products that are basically a grid configuration of plastic or other materials which hold the vegetation in place even after it is established. This helps to expand on the areas that can be considered for vegetative controls, as steeper slopes which couldn't be vegetated before, can now be vegetated with this type of product.

B) Rip Rap

Rip rap is basically large stones which are laid in an organized manner in erosive areas to dissipate energy. A layer of filter fabric is usually placed under the rip rap to separate and protect it from the erodible material under it. Rip rap can be used on banks and at outlets. The sizes of the rip rap used vary from case to case. Other materials such as recycled concrete can be substituted for rock materials. Concrete from old sidewalks and other structures can be crushed and used.

C) Concrete Structures

Concrete is a widely used material for erosion protection, as it is very resistant to erosive forces. Retaining walls, outfalls and other structures are constructed which prevent erosion. Concrete structures are placed at outfalls to prevent erosion to the surrounding areas. Walls are constructed to keep banks from eroding or redirect flows. Many concrete structures are currently in place along the river.

D) Grid Pavers

Grid pavers are concrete block structures with voids in them to allow for vegetation to grow. The grid pavers are laid in a series next to one another to line a bank or eroded area and provide resistance to erosion.

E) Interlocking Modular Pre-cast Concrete Units

The name of these structures explains the system quite well. This system is similar to the grid pavers in that they are concrete block structures which line a bank or eroded area. The difference with this system is that the blocks link to one another to provide a combined force of weight to resist erosion.

F) Combination Structures

Other methods of structural erosion controls exist which combine various methods listed above. Rip rap can be combined with concrete to be more resistant to erosion than without. Laid rock paths also can be installed with concrete to provide a more stable path which is also resistant to erosion. Many other different combination structural erosion controls exist and could be considered for use along the Black River.

G. FOCUS AREAS

Specifically, the existing and proposed access areas indicated on mapping from the City of Watertown's (LWRP) will be focused on in the EMP. These access areas are shown on mapping included in Appendix A and are listed below:

1. Existing River Access Areas

Today, the Black River is nationally known for its variety of recreational activities including rafting, kayaking, fishing, and scenic views. In order to take full advantage of these great natural resources, proper access to the river must be provided. Access to the Black River is provided by the following areas and parks:

- North Shore Access – NYS Route 3 and Marble Street
- Route 3 Car-Top Boat Launch and Fishing Access – NYS Route 3
- Waterworks Park and Kayak launch site – Huntington Street
- Van Duzee Street DEC Fishing Access – Van Duzee Street
- JCC Waterfront Trails and River Access – Coffeen Street
- Veterans' Memorial Riverwalk (No Direct River Access) – Newell Street
- Sewall's Island Car Top Boat Launch – Huntington Street
- BOB Rafting – West Main Street (private access only)
- Hudson River Rafting – Newell Street (private access only)
- Adirondack River Outfitters – Newell Street (private access only)
- Bicentennial Park – Coffeen Street and W.T. Field Drive
- Abe Cooper/Brookfield – Factory Street and Factory Square
- Hole Brothers Access – Newell Street

2. Proposed River Access Areas

Watertown is also a growing community with its close proximity to Fort Drum, and thus residential and commercial expansions are realistic. Future development opportunities are plentiful and potential future projects are listed below:

- Van Duzee Street Barns Residential Community
- Hole Brothers Waterfront Loft District

- Downtown Waterfront Gateway
- Downtown Connection – J.B. Wise Parking Area
- Factory Street and Sewall’s Island Mixed-Use Communities
- Eastern Islands Park and Recreation Area
- Bicentennial Park Improvements

H. ATTACHMENTS

Pertinent mapping, photos, reports, figures, and tables have been attached to this report for reference. They will be indicated throughout this report and are also listed in the Table of Contents.

II. RIVER INSPECTION AND ANALYSIS

A. GENERAL

As previously indicated, a walk through inspection of the river corridor was performed. The walk through inspection took place between 20 June 2008 and 8 December 2008. During the walk through, photos were taken of eroded areas, culverts which showed potential for erosion, existing access areas and other sections of the river that showed potential for erosion. Potential future access areas were focused on as well to try and predict if there would be any future erosion issues.

The photos of items of interest are included throughout this EMP. A detailed summary of the walk through will be provided which examines the aforementioned areas as they were discovered by traversing the river from the eastern limit of the corridor near Huntington Island to the western limits near Interstate 81.

Walk through inspections and analyses will be broken up into river sections which will be called sub corridors and are indicated on the Overall Map in Appendix A. These sub corridor sections will first be described in general with photos, and then specific areas will be concentrated on for which recommendations will be made. These specific areas will consist of the existing and proposed access areas, as well as certain areas of the river which may be eroding away or need attention. The attention required to address a certain areas erosion may range from simply inspecting it periodically to immediately placing structural erosion controls.

In addition to visual inspections, other resources of information on erosion in the Black River will be utilized for analysis. Past experiences individuals have had with erosion as well as historically eroded areas will be researched. Any information on certain areas of the river which have proven to be more prone to erosion in the past have been concentrated on. Photos from past flood events are also included for reference. "Critical vantage point" photos were taken of the river at different times throughout the year. These photos provide perspective into how the river changes from season to season as well as what flood levels might look like when compared to the critical vantage point photos which have recorded flows.

B. PAST EXPERIENCE AND HISTORY

As previously mentioned, the past was utilized to try and predict areas of erosion in the future. Those who worked at agencies with experience in erosion control along the Black River were contacted, looking for past erosion control measures which were successful, known erosion areas or any other pertinent information. Among the agencies contacted were: The Hudson River Black River Regulating District, the City of Watertown Department of Public Works, the City of Watertown Water Department, and the NYSDEC. In addition to contacting people, past history from newspapers and other sources were researched. In looking up past articles from the area related to the Black River, it was hoped that areas which were eroded or flooded in the past would be found. The Flower Memorial Library in the City of Watertown was utilized as the primary source for finding articles and documents related to the river.

1. Contacts

A) Hudson River Black River Regulating District

The chief engineer who works at the Hudson River Black River Regulating District in Buffalo was contacted to determine what types of erosion control were utilized by that agency. The HRBRRD does not typically work within the Black River areas in or around the City of Watertown. They do control the release of water from reservoirs to

the Black River and attempt to minimize erosion by controlling what they can in terms of flow releases, but are not generally responsible for mitigating erosion issues outside the reservoir areas.

For what erosion does occur in the reservoir area, it was revealed that rip rap around a 50% average diameter of 16" was used exclusively in that area for erosion control around dams. It was also determined that the erosion in that area was primarily from that of wave action, which generally isn't the primary source of erosion for the Black River within the LWRP boundaries; velocity is. The engineer spoken to also indicated that as of right now they are not using vegetative erosion controls, but that they may start implementing some into their erosion sensitive areas for mainly aesthetic reasons.

B) City of Watertown Department of Public Works

The Superintendent of the Department Public Works was contacted to see what erosion measures he has seen utilized in the past and where. Several areas which have showed evidence of erosion in the past, including: an area along Water Street which is close to the banks of the river, another area on Water Street where a emergency berm was constructed to keep water from overtopping from the river into Water Street, areas along Hole Brothers Park, outfalls near Veteran's Memorial Riverwalk, and the Kelsey Creek Outfall to the Black River. The areas mentioned are included in the riverbank inspections.

The areas along Water Street which were mentioned provide some interesting insight into erosion and flooding problems that have occurred in the past. During the 1998 Ice Storm and resulting flood, Water Street was overtopping and something had to be done to prevent this. To keep the water out of the street, the DPW constructed a makeshift berm along the river side of the street using run of bank gravel covered with plastic and a top layer of topsoil. This proved effective in keeping the high waters out of the nearby street. This method could also be used in the future in emergency situations similar to this. An additional area along Water Street, downstream of the hydroelectric facility comes close to the riverbank. This area has washed out in the past and had stone put back in to stabilize the area.

The Hole Brothers Park area near the DPW facility also was mentioned as an area that could use some erosion controls. This future park area has recently been worked on and the area has been left in an erosion susceptible state. Currently, topsoil lines the banks of the river and already is showing signs of washing away. If this is to be the final material for this area, it may want to be reconsidered as it will likely wash away. At a minimum, the vegetation on the topsoil will likely need to be given time to establish itself in the fall months before being exposed to erosive forces of the water.

The outfall areas from areas near Veterans' Memorial Riverwalk and Kelsey Creek were also mentioned as possible areas that were eroding away. It was indicated that erosion was in some cases washing away materials along the banks. These areas have been inspected and will be discussed in latter sections of this report.

C) City of Watertown Water Department

The superintendent of the City of Watertown Water Department was contacted to discuss the water filtration plant, the reservoir which feeds it, and other erosion controls which have been used by the City in the past. This contact has extensive experience including having served as the interim City Engineer in the past.

He indicated that the erosion around the reservoir were generally minor. The reservoir is required to be dredged every 3-4 years and the materials are placed in the nearby settling basins to drain. In some cases, minor erosion occurs as part of this process. It was also indicated that there were some areas of erosion around eastern and southern banks of Huntington Island. Some of these banks at one time were attempted to be stabilized by the City by using recycled concrete rip rap, but attempts were abandoned after a river resident complained, thinking that debris was being dumped into the river. If proper permitting is obtained and residents understand what is going on, it may be worth trying to use the recycled concrete again for erosion control.

D) New York State Department of Environmental Conservation

The NYSDEC was contacted to discuss if there were any known areas along the Black River within the LWRP boundaries that was known to have erosion issues. The primary area mentioned was the washout area near Bicentennial Park where broken thermometers and other refuse was found. The Hole Brothers Park area is known to wash out and reveal some broken glass at times. It was also advised that this report may want to consider the effects of ice erosion.

2. Research

A) Articles from the Watertown Daily Times

The Flower Memorial Library was utilized to research articles about flooding or erosion in the City of Watertown area. Some articles were found which indicated areas that repeatedly flooded. The common flooding and erosion areas seemed to be in the vicinity of Water, Factory and Huntington Streets. The most severe case of erosion found seemed to be the washout of approximately 300 feet of Water Street in 1993. The articles found are attached as part of Appendix E.

B) Photos from significant 1993 Storm Event

Photos from the 1993 storm event which peaked at 42,600 CFS were obtained which were taken at various locations within the City including at the Vanduzee Street Bridge and Route 3 Bridge. These photos are attached as part of Appendix E. Photos of the arguably more severe 1998 flooding were not able to be obtained.

C) River Flow Research

The United States Geological Survey (USGS) National Water Information System Web Interface was utilized to obtain pertinent flow statistics for the Black River and is located on the web at: <http://nwis.waterdata.usgs.gov/ny/nwis/nwismap/>. Data as far back as 1869 has been obtained from this website. As mentioned previously the highest recorded flow was on 10 January 1998 and was 55,500 CFS. The lowest recorded flow found was 336 CFS on 10 July 1987. April has the highest average monthly discharge rate at 9,980 CFS due to spring melt, while the lowest is August at 1,790 CFS average monthly discharge rate. Additional detailed data has been provided as described as follows:

- Average Flows (by year)
- Monthly Average Flows (for each year and overall)
- Peak Recorded Flows (by year with gage height)
- Lowest Recorded Flood Year Statistics (1987)
- National Weather Service Flood Description Information

Detailed information can be obtained from this website by date which contains means

and medians. All aforementioned data has been included in Appendix E and flow units are in CFS.

Note that the USGS website was used as the primary source of flow information. Some articles and other references may include data which conflicts with the USGS website data as they may have used other data sources.

C. SUB CORRIDOR OBSERVATION AREAS

1. Eastern Black River Waterfront Area

A) General

This sub corridor includes Huntington and Delano Islands as well as the Route 3 Wave Area as described in the LWRP. Existing Access areas within this portion of the river are: Route 3 Fishing Access and Car-top Launch, North Shore Access in Marble Street Park, and the Waterworks Park and Public Launch. Future LWRP plans which will hopefully someday utilize this portion of the river include the Eastern Islands Park and Recreation Area.

As mentioned, this portion of the river corridor is relatively calm as the cross section of the river is wider in most areas. This allows the river more cross sectional area to flow through, therefore flowing at a slower velocity compared with other sections of the river. Kayaking and canoeing are popular in this area because of this tranquil setting with great views. This section of the river was accessed on foot and with kayaks.

The lower section of the Eastern Black River Waterfront Area moves at a quicker pace than the upper portion. The lower portion includes the internationally famous Route 3 wave, which many come from around and outside the area to enjoy. This area was accessed by walking the banks of the river.

B) Walk Through

The inspection started by taking photographs from the southern banks of the river, near Ridge Road in the Town of Watertown along the Black River trail system. Photos 1-8 were taken in late Fall 2008 from the trails and look in the northerly direction towards Huntington Island. They pan from west to east along the Huntington Island banks. It is difficult to see, but there is evidence of minor erosion along the southern banks of Huntington Island in the vicinity of the small island just to the north of it.



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8

Photos 9 and 10 were taken from Ridge Road, downstream from the previous photos. Photo 9 is looking north at Huntington Island and shows the heavy vegetation which exists here. Photo 10 is looking northeast up the river.



Photo 9



Photo 10

As can be seen from viewing Photos 1-10, Huntington Island is heavily vegetated with trees and brush. This helps in some bank areas to prevent significant erosion from occurring. At these heavily vegetated banks, when the water moves at higher velocities, the vegetation will tend to keep the bank material in place.

Although velocities are normally low in this area, there still is evidence of gradual erosion in areas where there is no vegetation. This is likely because as the water flows past the banks and fluctuates in level, it slowly eats away at the material. In addition to this, the water velocity does become higher and more erosive when storms occur and during the annual spring melt. Photos 11-19 below show pictures of the southern shore of Huntington Island near the Route 3 Fishing Access Area and Car-Top Launch. These photos were taken from kayaks. These areas are indicated in the plan included in Appendix B.



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19

The southern banks of the river along Ridge Road seem to be fairly stable. Photos 20-24 show portions of this shoreline.



Photo 20



Photo 21



Photo 22



Photo 23



Photo 24

The Route 3 Fishing Access and Car-Top Launch was visited and used as an area to take photos. It was used as one of the critical vantage points for the EMP because of its openness and opportunity for views. Photos 25-28 were taken of the access area itself. Photo 25 is looking west towards the main entrance off NYS Route 3. Photo 26 is looking northeast from the boat launch area. Photo 27 is taken from the boat launch area and looks southwest towards the parking area and access to the deck area. Photo 28 looks in the northeastern direction towards the Water Filtration Plant's reservoir.



Photo 25



Photo 26



Photo 27



Photo 28

Photos 29-31 were taken looking southerly from the access area. A large portion of the southern riverbank can be seen from here in addition to parts of Delano Island. These southern banks are generally stable. Delano Island has some erosion issues which will be focused on.



Photo 29



Photo 30



Photo 31

Photos 32 and 33 were taken from the northern side of the Route 3 Fishing Access Area and Car-Top Launch area and overlook the reservoir for the water filtration plant. Sludge is stored in basins on the northwestern side of Huntington Island in this vicinity. Since this area receives a generally consistent amount of water, the erosion is very limited. It is reported that approximately every 3-4 years it is required to clean the reservoir of sludge and deposit it in the basins directly to the east. This is the only time when erosion is really a factor and even then it is minor. Photographs for Photos 34 and 35 were taken near the facility at the northern end of the reservoir looking to the south.



Photo 32



Photo 33



Photo 34



Photo 35

Delano Island, which is just above the Route 3 Bridge and dam was inspected on the eastern side from kayaks. The other sides were inspected from afar by taking photos. The eastern side appears to have the most significant erosion, as it opposes the current. Photos 36-40 show the eastern side of the Island and the eroded areas.



Photo 36



Photo 37



Photo 38



Photo 39



Photo 40

Photos 41-47 were taken from a maintenance access area to the northeast of the Route 3 Bridge. The western and northern sides of Delano Island were able to be seen from here. The photos pan from north to south from looking at the Route 3 Fishing Access and Car-Top Launch Area to the western side of Delano Island. There was no significant erosion visible from here.



Photo 41



Photo 42



Photo 43



Photo 44



Photo 45



Photo 46



Photo 47

By utilizing the fishing access area on Huntington Street just outside the City limits, inspections were able to be performed on the southern banks of Delano Island and the southern banks of the river. The photo in Photo 48 is looking northeast from the aforementioned fishing access area towards the dam which stretches from Delano Island to the southern bank of the river. Photos 49-52 are of the southern banks of Delano Island, panning from the east to the west and ultimately looking at the Route 3 Bridge in Photo 52. Photos 53 and 54 are of the southern bank of the river along Huntington Street. Photo 55 shows a discharge culvert to the river near the fishing access area. There does not appear to be any significant erosion issues in this area.



Photo 48



Photo 49



Photo 50



Photo 51



Photo 52



Photo 53



Photo 54



Photo 55

Photos were taken around the vicinity of the Route 3 Bridge. Views of the western side of Delano Island, the hydroelectric facility dam, Horseshoe Dam and the Route 3 Wave were able to be captured. Photos 56 and 57 were taken from the Route 3 Bridge and offer a view of the hydroelectric facility dam. The structure seems to be in safe operating condition.



Photo 56



Photo 57

Photos 58-61 were taken from the Horseshoe Dam and show portions of the southern river bank along Huntington Street. Photo 58 shows a portion of the dam structure itself. In general, these areas had no significant erosion problem areas as the shores are in many cases right on bedrock. Note that although Horseshoe Dam is no longer operational, it is important to monitor its condition to anticipate the effects of further deterioration.



Photo 58



Photo 59



Photo 60



Photo 61

Photos 62-64 were taken from the eastern side of the Route 3 Bridge and showcase the power of the river as it comes over the Horseshoe Dam and into the Route 3 wave area. Only large, heavy boulders are able to remain in this area as the smaller ones wash away.



Photo 62



Photo 63



Photo 64

Photos 65 and 66 show the dam itself along Route 3 is deteriorating from age and erosion.



Photo 65



Photo 66

Photos 67 through 72 were taken to show the immediate areas beneath and downstream of the Route 3 bridge, including the Route 3 Wave in Photos 71 and 72. Although the river flows along bedrock, some issues have progressed to a point where the bedrock shelf is falling into the river and creating a safety hazard. It is a safety issue, as the pictures from the Marble Street Access Area and from Mr. Norman Wayte's field report entitled "Erosion on the North Shore Route 3 Access" will show. The areas directly under the Route 3 bridge where some vegetation is growing, is slowly eroding away. Although, this doesn't seem to be cause for concern.



Photo 67



Photo 68



Photo 69



Photo 70

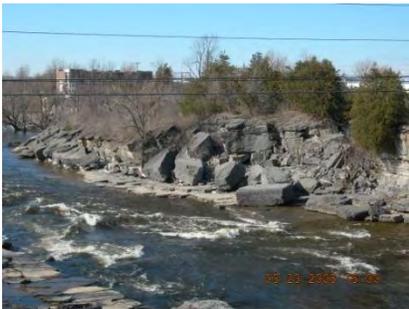


Photo 71



Photo 72

Photos 73-77 were taken of the banks around the Water Filtration Plant. There is noticeable deterioration of the structures in this area. Photo 73 taken near the Water Filtration Plant at the southwestern corner of Huntington Street and Route 3 and shows a retaining wall in poor condition. Photos 75-77 show a failing retaining wall which is directly adjacent to the Water Filtration Plant. Other deteriorating structures are also seen in these photos which will be discussed later in this report.



Photo 73



Photo 74



Photo 75



Photo 76



Photo 77

Photos 78-81 were all taken from the Marble Street Park, which allows access to the banks just to the north of the Route 3 wave. Photo 78 shows the parking and lawn areas. The steel pedestrian bridge which allows access over the hydroelectric plant canal is shown in Photo 79. Photos 80 and 81 were taken from the pedestrian bridge looking east and west, respectively. The canal is carved out of rock and the erosion is minimal.



Photo 78



Photo 79



Photo 80



Photo 81

Photo 82 shows the lookout strategically located above the Route 3 wave. Photos 83-85 are of the walkway and bridge that lead patrons down to the water's edge. This area will be discussed in the recommendations section for this portion of the river.



Photo 82



Photo 83



Photo 84



Photo 85

Photos 86-90 are of the banks of the river in the vicinity of the Route 3 Wave. Photos 86 and 87 show the general condition of the bank from afar, while Photos 88-90 show closer views of some of the erosion that has occurred in this area. In general, all sizes of stones line the bank. From smaller stones to huge boulders, these rocks have been deposited here for years and could present hazards to patrons. Now that this area is being accessed quite frequently, it is becoming more important to remove these hazards.



Photo 86



Photo 87



Photo 88



Photo 89



Photo 90

Photos 91-97 are taken of the Water Works Park Access area itself. Photos 91-94 were taken near the parking area. Photos 95-97 were taken farther into the park and closer to the river.



Photo 91



Photo 92



Photo 93



Photo 94



Photo 95



Photo 96



Photo 97

Photos 98-107 were taken in the general vicinity of Water Works Park Public Launch, off Huntington Street. A large portion of both the southern and northern river banks are visible from this area. Photos 98-101 include the eroding banks directly to the south and southeast which were discussed in the previous section.



Photo 98



Photo 99



Photo 100



Photo 101

The municipal hydroelectric plant can be seen in Photos 102-105. There didn't appear to be any significant erosion issues around the plant.



Photo 102



Photo 103



Photo 104



Photo 105

Photos 106 and 107 show some minor erosion that is occurring at the launch area from pedestrian traffic.



Photo 106



Photo 107

Photos 108-112 are of the Water Works Park and were taken from the northern banks of the river near the municipal hydroelectric plant. A concrete divider for the power plant can also be seen.



Photo 108



Photo 109



Photo 110



Photo 111



Photo 112

Photos 113-116 were taken along the banks of the Water Works Park to show the condition of the shoreline on the south side of the river in this area. In general bedrock is at or close to the surface. This along with the dense vegetation that has established itself along the shore has made for only minor erosion issues in this area.



Photo 113



Photo 114



Photo 115



Photo 116

Photos 117-119 were taken from Water Works Park, near the easterly launch area. These photos show the banks directly across to the north which are mainly limestone. This rock bank prevents significant erosion from occurring here.



Photo 117



Photo 118



Photo 119

Photos 120-124 were also taken from the southern shores of the river along the western portions of the Water Works Park. These photos show the erosion that is taking place on the northern banks of the river in this area.



Photo 120



Photo 121



Photo 122



Photo 123



Photo 124

C) Findings and Recommendations – Existing

Existing areas within the Eastern Black River Waterfront Area which will be concentrated on are: the eroding banks in the Eastern Islands Area, Route 3 Fishing Access and Car-Top Launch, Marble Street Park, deteriorating Water Filtration Plant structures, and the Water Works Park and Launch.

(1) Eastern Islands Area

Inspections of this portion of the river revealed some areas which were in need of attention. Most notable were the areas around the Huntington and Delano Islands where the banks are slowly eroding away as described in the previous section.

It is interesting to note that not all the erosion areas are predictable. Some areas where it would seem like the banks would be eroded away based off similarities to other eroded banks do not erode. It is in these latter mentioned areas where there is generally thick growing vegetation which holds onto the bank material.

Refer to Photo 125 in which the river bank appears to be in fairly stable condition. Just down river, another section of bank with similar grades is eroding away as shown in Photo 126.



Photo 125



Photo 126

It is easy to see that when vegetation grows on the banks, it greatly mitigates the effects of erosion. This makes it logical that by planting native vegetation along eroded areas of the river would help to keep erosive forces at check. In general, the gradual eroding away of the banks in this area seems to be the most significant form of erosion. It is recommended that vegetation be planted in unstable areas to prevent this from happening. Photo 127 shows a close up shot of the upstream side of Delano Island which is eroding away. Photo 128 shows evidence of some undermining on the banks of Huntington Island which would be difficult to prevent. It has occurred even with the presence of vegetation. It is difficult to determine if this undermining is continuously eating away at the bank material or if it has reached a stable point. These undermined sections should be monitored to see the progression from year to year. If it is determined that this undermining is removing material at a substantial rate and that it needs to be prevented, it may be necessary to install structural measures such as rip-rap or even retaining wall structures. Vegetative options for stabilization are discussed in section I.F.1.



Photo 127



Photo 128

(2) Existing Route 3 Fishing Access and Car-top Launch

This site allows for access to the Black River around Huntington and Delano Islands. This point consists of a gravel launch for a small boat or canoe and a fishing deck that is handicap accessible. The river around this site is wide open and gently flowing which provides for good fishing and other recreational activities. Due to this generally low velocity, the area shows little evidence of erosion due to gentle slopes of surrounding lands and asphalt pedestrian walkways.

(3) Existing Marble Street Park Access Area

This access area provides for many different activities. The park consists of a baseball field, human bridge and trail to the river bank, and observation decks. As previously mentioned, the Route 3 wave is one of the primary attractions of the Black River. There are several areas around the Route 3 Wave which are used for access. A pedestrian bridge was installed to facilitate access to this area. The new pedestrian bridge and walkway in general serve their purpose well and should be expanded on in the future if possible as the areas around this where pedestrians stand to view the Route 3 wave are very unstable in some spots.

Hand laid rock paths which are held in place with concrete were constructed in some areas of the pedestrian paths. These rocks not only provide an attractive way to traverse the banks, but also help to prevent erosion when the water level rises. There are steep areas of the pedestrian paths in which the hand laid rock path was not constructed where the crushed stone material is eroding away. These areas should be considered as areas for additional hand laid stone walkways with concrete.

Possibly the most serious erosion that is occurring in this area is of the banks in this area as seen in Photos 71, and 85-90. These unstable areas put the safety of the pedestrians at risk. Refer to Mr. Norman Wayte's field report entitled "Erosion on the North Shore Route 3 Access" dated 14 July 2008 and attached as Appendix C. Mr. Wayte's report, it's photos, and Photos 78-90 of this document show Marble Street access and its unstable areas. It is generally suggested that the unstable boulders, trees and other materials be removed. It may be helpful to introduce vegetation in this area to help stabilize soil on the banks. Although, there are not many areas here that this would be effective, as it is mostly rock.

(4) Existing Water Filtration Plant Structures

As indicated in the inspection portion of this report, the Water Filtration Plant has several deteriorating structures nearby which should be monitored and/or repaired. Photo 76 shows a retaining wall which is failing. This wall should be repaired in the near future as it will only continue to get worse. Other structures exist around the filtration plant which are starting to show their age. Photo 98 shows the retaining walls and structures in the water which are deteriorating. Photos 129-132 show the cracks which are developing in the concrete retaining wall near the plant. All of these structures around the plant should be included in the inspection program to periodically evaluate them and determine if repairs are necessary.



Photo 129



Photo 130



Photo 131



Photo 132

(5) Existing Water Works Park and Launch Area

Water Works Park is a great place for accessing the Black River. There is a launch area for kayaks and canoes, as well as a pedestrian trail system. This area and all other river areas visible from it were inspected for erosion. The following information was revealed:

Along the shores of the river adjacent to the Water Works Park there were little to no signs of erosion. In general, this area has thick vegetation growing up to the banks which inhibits erosion quite well. There are a few scattered areas where erosion has caused some cobbles to break loose and remain at the shore as seen in Photo 114. These do not seem to be causing any trouble at this time.

Some areas of the Water Works Park trail system show evidence of erosion from heavy pedestrian traffic. These areas should be included as part of the inspections. It is recommended that larger crushed stone be placed along eroding areas of the pedestrian trails. The stone that is laid down originally for these trails is of smaller aggregate size.

(6) Existing Banks North of Water Works Park and Launch Area

Looking outwards from the banks of the Water Works Park, eroding banks and retaining walls can be seen. Photos 120-124 show the erosion that is taking place along the banks opposite the Water Works Park. Photos 133 and 134 below show other areas in the vicinity. Photo 133 shows the loose material which exists in some areas. Photo 134 is within 100 feet of Photo 133, but shows how vegetation holds the bank material in place. It is recommended that these areas be planted with appropriate vegetation to prevent the earth from eroding away. They should also be inspected periodically to track the erosion. More seriously eroding areas could be considered for the use of recycled concrete.



Photo 133



Photo 134

D) Findings and Recommendations – Proposed LWRP Plans

The LWRP Plan calls for several improvements to be made along the Black River banks within the City of Watertown area. This section of the EMP will provide recommendations on erosion control for proposed developments within this sub corridor including the Eastern Islands Area, Marble Street Park Access Area, and the Waterfront Trail System.

(1) Eastern Islands Area

This potential waterfront project already possess' natural scenery and beauty and is largely undeveloped. A large park with access to Delano Island is proposed along with a nature preserve. To improve access to the Route 3 Wave, a pedestrian path is proposed indirectly between Waterworks Park and Marble Street Park which would utilize the Route 3 Bridge. This site offers some unique challenges, but really offers potential for development and renovation.

The LWRP Plans call for Delano and Huntington Islands to be converted into parks and launch areas as shown in Figure A from the LWRP plan. Knowing that these Islands could someday be developed, it is important to understand what erosion factors will need to be considered. As seen in Section II.C.1, there are slowly eroding areas which under undeveloped conditions could be mitigated through the use of vegetative measures. In most cases these vegetative measures should still be a viable option even with the islands transformed into access areas.



Figure A

With development of areas come additional traffic and more potential for erosion. In most cases, the banks would remain unchanged even when LWRP plans go forward. The intent of the development on these islands is to allow the public to access the natural environments that are currently there. The pedestrian paths shouldn't have a significant effect on the islands themselves. Although, the access areas may. These launch areas will likely be similar to the Route 3 Fishing Access Area Boat Launch. The differences that may be encountered are likely to be that the waters near Delano Islands tend to move more swiftly than waters near the Route 3 Fishing Access and Boat Launch Area. Due to the higher velocities of water encountered here it will be important to strategically place the launch areas as well as to place the appropriate material.

Well graded crushed stone and possibly even larger cobbles and boulders may need to be placed to keep the materials around the proposed launch areas from washing away. In addition to these materials, placing the launch areas out of the higher velocity areas will help as well. Launch Areas closer to the Route 3 Bridge may require larger stone rip rap as velocities tend to be higher in this area than upstream.

(2) Marble Street Park Access Area Improvements

The LWRP plan calls for the improvement to access to the Route 3 wave and plans are in the works which call for a new pavilion and trails around the park. When constructing these new amenities, close attention should be paid to erosion control devices which will be near the hydroelectric plant canal. It is not likely, but erosion could take place on these banks if proper precautions are not taken.

Plans beyond this, future plans likely include trails down to and along the river in this area. As discussed in previous sections, it is first recommended that the large and unstable cobbles and boulders be removed from this area as they are a safety hazard. It is also recommended that the trails in this area be made of more stable materials similar to the paths that were constructed from the pedestrian bridge down to the Route 3 Wave Area.

2. Water Works Park to Mill Street Bridge Area

A) General

This section of the river contains three islands: Diamond Island, Sewall's Island and Beebee's Island. These islands present opportunities for development within this sub corridor. The LWRP specifically identifies Sewall's and Beebee Islands for development. Sewall's Island has been planned out as "Sewall's Island Mixed Use Community" and Beebee Island is to hopefully be developed into "Downtown Waterfront Gateway" with the "Downtown Connection" providing access from Public Square.

Existing access areas within this sub corridor are: Sewall's Island Car-Top Launch and the Abe Cooper Site off of Factory Street. Existing areas which are susceptible to erosion and will be discussed are: the Water Street Erosion Area, the southern Mill Street Bridge Area and the Dealmaker Body Shop Facility bank area. This sub corridor of the river is also home to three privately owned hydroelectric facilities. These areas are identified on GYMO prepared mapping in Appendix A and LWRP mapping in Appendix B.

B) Walk Through

Continuing the inspection just to the northwest of Water Works Park, retaining walls in poor conditions are encountered near the Chapin Watermatics facility as seen in Photo 135. Photo 136 is a close up of the concrete retaining wall which is being eroded away at the normal water elevation.



Photo 135

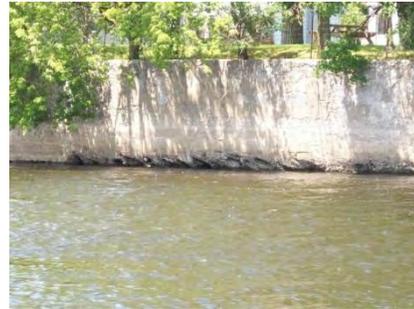


Photo 136

Photos 137 and 138 were taken from the parking area of Chapin Watermatics and look upstream. These two photos show the areas discussed about in the previous sub corridor.



Photo 137



Photo 138

Photos 139-141 were also taken in the general vicinity of the Chapin Watermatics facility. Photo 139 shows the banks directly across the river. Photos 140 and 141 were taken looking downriver. There does not appear to be any significant erosion concerns in these photos.



Photo 139



Photo 140



Photo 141

Photos 142-144 were taken to the northeast of Chapin Watermatics along Water Street. A makeshift berm which was constructed during the 1998 flooding still remains. This is a good example of controls that can be constructed in emergency situations.



Photo 142



Photo 143



Photo 144

At this point in the river, it splits into two legs to get around Diamond Island. There is a privately owned hydroelectric facility at this point. The southerly leg of the river is dammed up to channel water to the northern leg and through the facility to generate power. Photos 145-158 were taken on the southern side of the river near the dam between Diamond Island and the northern bank of the river. Photos 145-148 were taken looking in the direction of the Chapin Watermatics facility. Retaining walls can be seen along the banks which seem to be in good condition.



Photo 145



Photo 146



Photo 147



Photo 148

Photos 149-151 are of the hydroelectric facility. Grates are seen which filter debris out before it enters the facility for power generation.



Photo 149



Photo 150



Photo 151

Photos 152-156 start by viewing the dam and pan to the west, ultimately looking downriver. Photo 155 shows a concrete retaining wall along Diamond Island which appears to be in good condition.



Photo 152



Photo 153



Photo 154



Photo 155



Photo 156

Photos 157 and 158 are taken along the southern river bank near the dam. Photo 157 shows a trail that travels along the river bank in this area. Photo 158 shows a culvert outfall from Huntington Street. It is eroding away at the outlet. The rip-rap at the outlet could be extended to be closer to the river to prevent erosion.



Photo 157



Photo 158

Photos 159-168 were taken downstream of the aforementioned hydroelectric facility along Water Street. This is the northern leg of the river between Diamond Island and the northern riverbank. Photo 159 and 160 are looking easterly towards the hydroelectric facility. Photo 161 is looking directly across the northerly leg at Diamond Island. Photo 162 is looking westerly down the channel towards the end of Diamond Island where the river converges back into one channel.



Photo 159



Photo 160



Photo 161



Photo 162

At this location, the river gets close to Water Street. The river tends to wear away at this portion of the bank as it makes a gradual left hand turn towards the downstream end of Diamond Island. These forces have caused washouts here in the past. Photos were taken of this area to record what erosion controls were in place. Photo 163 is looking in the westerly direction down Water Street and shows the area being discussed. Photo 164 is a closer view of the area. Crushed stone seems to have been placed to help prevent erosion. Photo 165 shows a drainage outlet to the river. The outlet itself doesn't seem to be causing any significant erosion. Photo 166 shows larger rip rap material just to the east of the previous three photos. This area should definitely be included in the areas to be inspected periodically. Photos 167 and 168 were taken looking downriver to the west. These bank areas appear to be stable.



Photo 163



Photo 164



Photo 165



Photo 166



Photo 167



Photo 168

Photos 169-183 were taken in the area to the south of Diamond Island along Huntington Street. Photos 169 and 170 were taken off of Huntington Street and look easterly towards the dam between Diamond Island and the southern bank of the river. Photo 171 shows a culvert outfall to the river. It has little erosive effect because of the rock it falls onto. A makeshift access area is seen in Photo 172 which looks to be used for fishing. In general, this area appears to be stable because of the bedrock banking.



Photo 169



Photo 170



Photo 171



Photo 172

Photos 173-177 are of the southern riverbank along Huntington Street. In general, the banking closer to the dam to the east is stable due the rock material. A laid rock retaining wall exists along Huntington Street in the vicinity of Indiana Avenue North close to the water's edge and can be seen in Photos 176 and 177. This wall seems to be in good condition. It should be inspected periodically to evaluate its condition.



Photo 173



Photo 174



Photo 175



Photo 176



Photo 177

Photos 178-183 are of the northern banks of Diamond Island and where the river converges into one channel after the island. Photos start on the upstream side of Diamond Island and pan down to the single channel after the Island. Banks in this area are relatively stable.



Photo 178



Photo 179



Photo 180



Photo 181



Photo 182



Photo 183

Photo 184 is an aerial shot obtained from an online article entitled “LIHI Certificate #34 – Black River and Beebee Island Project, Black River New York – LIHI Certifies Brookfield Power’s Black River Project at Their March Meeting” dated 27 March 2008 at www.lowimpacthydro.org. This Photo is of the hydroelectric facility located on Sewall’s Island.



Photo 184

Photos 185-188 were taken from the Sewall Island Car-Top Launch near the intersection of North Hamilton and Huntington Street's. Photos 185 and 186 are of the access area itself. Some erosion from pedestrians is noticeable along the river access trail. Photos 187 and 188 are of the banks at the launch area which are stable.



Photo 185



Photo 186



Photo 187



Photo 188

Photo 189 and 190 were taken looking to the northeast at the banks on the opposite side of the river. Photo 191 is looking north at the eastern tip of Sewall's Island where the river splits into two channels. There are no noticeable points of erosion here.



Photo 189



Photo 190



Photo 191

Photo 192 was taken looking north across the dam between Sewall's Island and the southern riverbank. Photo 193 is taken toward the northwest at another dam structure. Photo 194 is facing towards the west at the hydroelectric facility outfall. Structures in this area are in good condition.



Photo 192



Photo 193



Photo 194

Photos 195-199 were taken around the rail road bridge which stretches from the northern bank of the river to Sewall's Island. Photo 195 looks south back towards the Sewall Island Car-Top Launch. Photo 196 is looking west down the northern leg flowing around Sewall's Island. Photo 197 is of what appears to be an abandoned hydroelectric facility to the west of the railroad bridge. Photo 198 is a show taken looking southwest along the abandoned railroad bridge. Photo 199 shows a laid rock and mortar structure that was likely used to support some sort of bridge at one time which is in poor condition. It is not supporting anything at this time but should be structurally inspected and evaluated if it going to be used for any type of access to Sewall's Island.



Photo 195



Photo 196



Photo 197



Photo 198



Photo 199

Photos 200-203 were taken from the northernmost of the two Pearl Street Bridges looking to the east. Photo 200 was taken looking to the east up the river. Retaining walls in the distance on the northern banks of the river can be seen which should be included in the periodic inspections along the river. Photos 201-203 show the banks of the river near the bridge to be of bedrock. This prevents any significant erosion from occurring in this area.



Photo 200

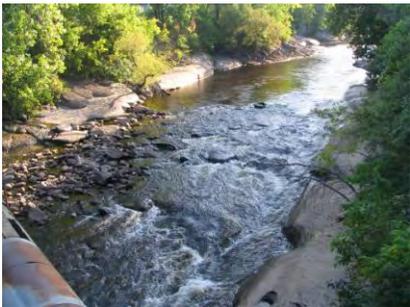


Photo 201



Photo 202



Photo 203

Photo 204-208 are from the northern most Pearl Street Bridge. Photo 204 is a view looking straight downriver. Erosion can be seen on the southern bank of the river. This area should be included in the periodic river inspection. Photo 205 shows a portion of the northern banks in this area, which are mostly of rock and makes for little erosion.



Photo 204



Photo 205

Photo 206-208 are of the piping that cross the river at the northern Pearl Street Bridge. Photo 206 shows the pipes as well as a retaining wall structure in the background which should be inspected periodically. Photo 207 shows the base of one of the support structures for the piping that is being undermined. The extent of the erosion which has taken place is uncertain. A structural inspection should be performed to assess whether or not this support needs repair. Photo 208 shows an outfall pipe to the river on the north bank in this area. It has been broken, but still could function.



Photo 206



Photo 207



Photo 208

Photos 209-212 are of the southern portion of the Pearl Street Bridge, looking upstream to the east. The banks in this area are mostly of stable bedrock. An abandoned railroad bridge from Sewall's Island to the southern bank of the river is seen in the photos. This bridge may be considered for pedestrian access to Sewall's Island in the future as part of the LWRP plan. Photo 212 shows a photo of one of the supports of this bridge. It is recommended that a detailed structural inspection be performed on this prior to consideration of use as pedestrian bridge. (Note: Bridge supports are included in the NYSDOT Biennial Bridge Inspections.)



Photo 209



Photo 210



Photo 211



Photo 212

Photos 213-215 were taken from the northern Pearl Street bridge looking downstream towards the west. The banks are mostly bedrock and are stable. There are some concrete remains on the northern bank of the river which are seen in Photo 214. These remains should be removed if the riverside trail system comes through this area as they could pose a safety hazard to pedestrians.



Photo 213



Photo 214



Photo 215

Photos 216-221 were taken from the Abe Cooper Site off of Factory Street. This site allows access down to the river's edge via a stairway as seen in Photo 216. Also in the background of Photo 216, the deck area which overlooks the river can be seen. Photos 217-219 were taken from the deck. Photo 217 is looking upriver towards the northeast. Photo 218 is looking at the river bank directly across from the deck area. Some erosion is occurring in this area. It is mainly material falling from the top of the bank down into the river. The edge of the river itself is limestone and is stable. Photo 219 is looking downriver towards the southwest. Photo 220 is a close up shot of the gravel walking trail which is eroding away. Photo 221 shows crumbling brick and mortar along the stairway down to the river's edge. There are some areas of concern at this access area which will be discussed in more detail in the recommendations section for this sub corridor.



Photo 216



Photo 217



Photo 218



Photo 219



Photo 220



Photo 221

Photo 222 is an aerial shot obtained from a online article entitled “LIHI Certificate #34 – Black River and Beebee Island Project, Black River New York – LIHI Certifies Brookfield Power’s Black River Project at Their March Meeting” dated 27 March 2008 at www.lowimpacthydro.org. The hydroelectric facility on Beebee Island is shown.



Photo 222

Photos 223-226 were taken from the southern banks of the river, upstream of Mill Street and show the conditions of the retaining structures near the upstream portion of the hydroelectric facility. Photos 223 and 224 are of the retaining wall on the eastern banks of Beebee Island. This retaining wall appears to be in good condition. Photo 225 shows the inlet to the hydroelectric facility and the upstream view of the dam. A retaining wall in fair condition is shown on the northern banks of the river in this area is shown in Photo 226. The structures in this area should be included in a periodic inspection.



Photo 223



Photo 224

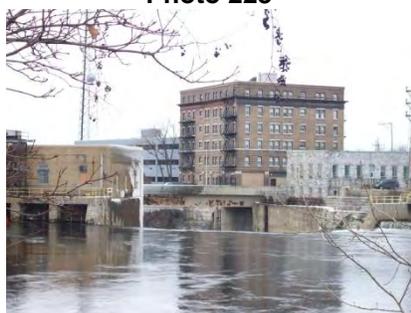


Photo 225

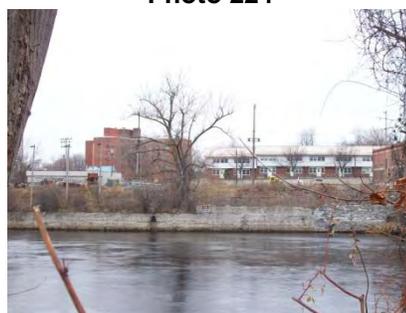


Photo 226

Photos 227-231 were taken from the northern portion of the Mill Street Bridge and look upstream to the northeast. Photo 227 is an overall look at the dam. Photos 228-231 pan from north to south while looking downward from the bridge. Outlet structures appear to be in good condition. They should be included in the periodic inspections recommended.



Photo 227



Photo 228



Photo 229



Photo 230



Photo 231

Photos 232-235 were taken from the southern portion of the Mill Street Bridge, look downstream to the west and pan from southwest to northwest. The banks close to water's edge in this area are fairly stable due to them being rock. Photo 233 shows a portion of the upper bank on the south side of the river which has collapsed. This shows how the bank can give way under erosive conditions. Although in this area it is not a threat, similar erosion could occur in other areas which might be.



Photo 232



Photo 233



Photo 234



Photo 235

Photos 236-239 were taken from the southerly portion of Mill Street Bridge and look upstream to the east. This portion of the river channel flows between Beebee Island and the mainland to the south. This portion of the river flows along buildings as seen in Photos 236 and 237. These buildings appear to be in good condition but should be part of the periodic recommended inspections as conditions can change over time. Photos 238 and 239 show the banks of Beebee Island in this area to be steep and covered with vegetation that inhibits erosion. These banks should also be inspected periodically.



Photo 236



Photo 237



Photo 238



Photo 239

Photos 240-250 are taken in the vicinity of the southern portion of the Mill Street Bridge. These photos are of the downstream portion, west of the Mill Street Bridge, between Beebee Island and the mainland banks to the south. Photos 240-243 were taken from the bridge looking downstream. As can be seen from these photos, the water flows right up against structures in this area. Photo 243 shows the Beebee Island banks which are very steep and are held back by ageing and crumbling retaining structures. The Beebee Island banks should be inspected periodically for erosion.



Photo 240



Photo 241



Photo 242



Photo 243

Photos 244-246 are of the deteriorating structures along the southern banks of Beebee Island downstream of the Mill Street Bridge. As can be seen from the site plans, there are buildings which sit very close to the banks in this area. These buildings look to be supported or partially supported by retaining structures which are in questionable condition. Photo 244 was taken from the bottom of the southern Beebee Island bank and shows the structure. Photos 245 and 246 are more detailed photos of these structures. Photo 246 especially shows the deteriorating condition of the retaining structures, as the stones are slowly falling out of the wall.



Photo 244



Photo 245



Photo 246

Photos 247-250 were taken from the lower southern banks of Beebee Island of the northern banks of the river. Photos 247-249 pan from southeast to southwest and show the building structures which are right on the bank in this area and are in questionable condition.



Photo 247



Photo 248



Photo 249



Photo 250

Photos 251-253 were taken near the Adirondack River Outfitters private river launch area west of the Mill Street Bridge on the southern banks of the river. Photo 251 is looking upstream to the east. Photo 252 is looking downstream to the northwest. Photo 253 is a shot of a launch in progress looking to the west down the river bank. This launch area seems fairly stable as there is crushed stone in place along the bank.



Photo 251



Photo 252



Photo 253

Photos 254-259 were taken from the southern banks of the river near the Veterans Memorial Riverwalk Park. Photo 254 is looking to the southeast towards Beebee Island. Photo 255 is looking to the east at Beebee Island and the outlet from the Mill Street Bridge. The steep banks of Beebee Island can be viewed from here. Vegetation currently holds material in place along these banks. Photos 256 and 257 look to the generally northeastern direction at the northern banks of the river. Buildings sit close to the river in this area on bedrock. Photo 258 looks in the northerly direction at the banks directly across the river. An outlet pipe can be seen which likely drains the Dealmaker facility parking area off of Main Avenue. This outlet pipe seems to be eroding the lower loose materials away under it. Photo 259 is a cropped close up of the previous photo which shows the chain link fencing concrete foundations exposed along the parking area across the road. Employees at the corporate office of Dealmaker on Main Avenue have been informed of this eroded area.



Photo 254



Photo 255



Photo 256



Photo 257



Photo 258



Photo 259

Photos 260-262 were taken on the northern banks of the river from the Dealmaker Body Shop parking area. Portions of the western Beebee’s Island bank can be seen from Photos 260 and 261. These steep banks appear to be limestone bedrock at the edge of the water, but up higher loose materials are held in place by vegetation. Photo 262 shows the Adirondack River Outfitters private launch area.



Photo 260



Photo 261



Photo 262

C) Findings and Recommendations – Existing

Existing areas within this sub corridor which will be concentrated on are: the historically eroded area on Water Street, Sewall Island Car-Top Launch access area, Abe Cooper Access Site, the southern Mill Street Bridge area and the Dealmaker Body Shop area.

(1) Water Street Erosion Area

Photos 163-168 are of this area which has washed out in the past. The area appears to currently be stable. Although, the material that was used to replace the washed out material appears to be undersized and could be washed out in another significant storm event. This material could either be replaced in the near future with properly sized rip-rap or when it washes out. It may be determined in a detailed analysis that a retaining wall needs to be constructed in this area to prevent a washout. At a minimum, this area should be inspected periodically.

(2) Sewall Island Car Top Launch Access Area

This access area was in generally good condition with the exception of some minor erosion that is occurring from pedestrians accessing the water in this area as shown in Photos 185-188. It may be beneficial to install a concrete or asphalt pathway to the water's edge. Another option would be to install additional crushed stone of a larger grade.

(3) Abe Cooper Site

Photos 216-221 are of the Abe Cooper site and show the general condition of it. This site and its access points were recently constructed and accomplish their general purpose. The deck area provides a great view of the river and the stairs to the river are constructed well. There are areas which are being effected by erosion.

The material that was placed for the pedestrian paths is easily washed away by water which flows to the river as shown in Photo 220 and the area at the bottom of the stairs is eroding away. The brick and mortar structures which are along the stairway are crumbling away. At the bottom of the stairway at the river's edge are abandoned industrial structures which are crumbling as well which could pose a safety hazard to pedestrians which visit. Photos 263 and 264 were taken from the bottom of the stairway and look to the north and northeast, respectively.



Photo 263



Photo 264

It is recommended that the areas at the bottom of the stairs be cleared of debris and the structures either be removed or stabilized. If necessary rip rap could be placed in this area in a strategic stepped fashion which would double as pedestrian sitting areas. These strategically stepped sitting areas could be placed inside the existing concrete remains, if a structural inspection deemed the structures to be safe to do so. If the structures are to remain as a wall along the stairs, the crumbling brick and mortar should be repaired.

(4) Mill Street Bridge Area

As seen in photos 240-250, the areas around the southerly Mill Street Bridge flow along buildings and very steep banks. Some of these banks have buildings very close to the top which are supported by deteriorating retaining wall systems such as the southerly bank of Sewall's Island, downstream of the Bridge. The buildings along the southern banks of the river at the water's level near Beebee Island are also susceptible to erosive forces of the water and do show deterioration in some areas. These retaining structures and buildings should be structurally inspected thoroughly to determine if the buildings along the top of the banks are properly supported.

(5) Dealmaker Body Shop Facility

The banks near the Dealmaker Body shop facility, which is across from the Veterans' Memorial Riverwalk, are very steep. In addition to being steep, the upper banks consist of erosion susceptible soils which are in most areas, protected from erosion by thick vegetation. When facilities and parking areas are built close to the banks of the river, as they were in this case, the natural erosion protection of the banks can be effected.

As seen in photos 258 and 259, a portion of the bank near this facility is eroding away to the point where the chain link fencing around the perimeter of the northern most parking area has the post foundations exposed. These foundations of course, are very close to the pavement where vehicles are driven and parked. At this point, the pavement in this area does not seem to be in danger of collapsing. Although, this is a possibility. The corporate office at the Dealmaker Body Shop facility was notified of this eroding area.

In the future, it is recommended that when site plans are reviewed, a setback be required from the top of very steep river banks such as this. Exceptions could be made, as conditions allow. This is discussed in more detail in the recommendations section of this report.

D) Findings and Recommendations – Proposed LWRP Plans

The LWRP Plans call for several improvements to be made along the Black River banks within the City of Watertown area. This section of the EMP will provide recommendations on erosion control for proposed developments within this sub corridor including the Sewall's Island Mixed Use Community, Downtown Waterfront Gateway, Downtown Connection and the Riverfront Trail System.

(1) Factory Square and Sewall's Island Mixed Use Communities

Factory Square offers the opportunity for redevelopment of both commercial and residential communities. On the other hand, Sewall's Island offers an ideal recreational park with access to the river for kayaking and many other water sports and related activities. Sewall's Island rail bridge offers access to the river through renovation into a pedestrian overpass. Past contamination may slow the redevelopment of these areas, but once remediation is complete, they offer great economic and recreational opportunities for the City.

Figure B shows a sketch plan of Factory Square and Sewall's Island Mixed Use Communities, which was obtained from the "Black River Vision Plan" and the LWRP plan for the City of Watertown. As mentioned, this plan involves connecting Sewall's Island to the Abe Cooper Site and the rest of the surrounding community. The two abandoned railroad bridges could be converted into pedestrian access bridges.



Figure B

Things to consider when developing this site in detail are the remains of structures around Sewall's Island and the banks near the Abe Cooper Site. These banks are home to deteriorating structures which should be evaluated for structural integrity as well as safety. As discussed in the previous section on the Abe Cooper site, these structures could be used to enhance the access to the river, rather than be removed and add more to the cost of the project.

Sewall's Island alone has three abandoned industrial structures which were likely used at one time to generate some type of energy. Overall Plan – 1 in Appendix A shows the abandoned riverbank structures which were discovered during the riverbank inspections. These structures could be utilized for lookout decks or additional access areas along the Waterfront Trail System.

The abandoned railroad bridges which may be used for pedestrian access should also be evaluated for structural integrity and in terms of safety for use as it was revealed during the inspections that the supporting structures on these bridges are showing signs of wear and tear. Some repairs may be all that is necessary to make the bridges useable.

The banks of the river in this area are mostly of rock and are generally stable at the water's edge. The canyon like shape that is carved out by the river does make for some areas where the materials higher up the bank give way to erosion and collapse into the river. Refer to photo 204 which shows the unstable bank along the northern bank of Sewall's Island. The banking in this area has started to collapse. These upper bank areas should be studied in detail before any development to determine if stabilization is necessary. Unstable materials could be removed in these areas in some cases to solve this problem. In more severe situation where the banks could collapse, retaining structures could be designed and installed.

(2) Downtown Waterfront Gateway and Downtown Connection

The Downtown Waterfront Gateway and the Downtown Connection are listed as two separate projects in the LWRP plan. Due to their close proximity and general effect on one portion of the river, they will be considered together. The basic idea of these projects is to develop the southern shore of the river and Beebee Island and connect them to the existing Public Square. A pedestrian bridge from Beebee Island to the south shore of the river would be constructed to marry the Beebee Island development to the mainland development. Refer to Figure C below, which is a sketch plan from the LWRP plan which shows the general layout.



Figure C

The canyon-like setting of this area provides for great development opportunities as well as significant erosion related challenges. Although the lower banks in this area are generally limestone and highly resistant to erosion, the existing and proposed structures along the banks need to be continually monitored for the effects of erosion.

As discussed in the various sections of this report, and seen in photos 240-250, the areas downstream of the southern Mill Street Bridge are in need of attention. The existing structures along the southern bank of the river in this area look to be deteriorating. Before any development is considered for these structures, the structural and safety concerns should be addressed.

In addition to the southern banks in this area, the southern banks of Beebee Island should also be evaluated by structural inspectors to determine if the retaining wall structures that are currently supporting the buildings along the top of this bank are sound. If not, it may be necessary to remove the buildings that are unstable. Other buildings along the steep banks around Beebee Island and the mainland should be inspected in this area.

In looking at the LWRP sketch plan of this area, it looks like many areas are to be developed right along the top of the bank such as on the southern banks of the

river, between Veterans' Memorial Walkway and the Downtown Connection where thick vegetation currently exists. This existing vegetation provides natural erosion control and should be replaced with some other type of erosion control if it is removed.

3. Veterans' Memorial Riverwalk to Interstate 81

A) General

The river varies from swift moving rapids in the Hole Brothers Park area to calmer waters near the Interstate 81 bridge. This sub corridor of the river contains various existing and proposed access areas. Existing access or lookout areas within this area include: Veterans' Memorial Riverwalk, Hole Brothers Park, B.O.B. Rafting Launch Area, Hudson River Rafting Launch Area, Bicentennial Park, Vanduzee Street DEC Fishing Access Area and the Waterfront Trails near Jefferson Community College. Proposed projects within this sub-corridor include: Hole Brothers Waterfront Loft District, Vanduzee Barns Residential Community and Bicentennial Park Improvements. Existing and proposed access areas are labeled on the Overall Plan included in Appendix A. The existing Hole Brothers Park, Vanduzee Street DEC Fishing Access Area and Bicentennial access areas will be included in the proposed access areas as upgrades are planned in the near future. The deteriorating retaining walls north of the Hole Brothers Wave will also be discussed.

B) Walk Through

The walkthrough inspection continues in the vicinity of the Veterans' Memorial Riverwalk. Photos 265 and 266 were taken from the high southern banks of the river at the pipeline that crosses the river and capture the northern banks of the river. Photo 265 was taken in the eastern direction. Photo 266 looks to the northeast. The banks in this area are steep but appear stable likely because of the vegetation holding the loose materials in place. They should be included in the periodic inspections.



Photo 265



Photo 266

Photos 267-270 were taken from the southern banks of the river near the Veterans' Memorial Riverwalk and provide additional views of the southern banks in this area. These photos generally pan from the northeast to northwest along the northern banks of the river.



Photo 267



Photo 268



Photo 269



Photo 270

Photos 271 and 272 were taken from Veterans' Memorial Riverwalk which is on the upper southern banks of the river. Photo 271 is looking in the northeastern direction and shows how this area is significantly higher than the river itself, which provides for pleasant views. It also shows the bedrock bank directly across the river. Photo 272 looks to the north at the river below and the small islands within the river.



Photo 271



Photo 272

Photos 273-275 were taken from the lower southern banks of the river near Veterans' Memorial Riverwalk. Photo 273 is looking in the northeastern direction and shows how the small islands in the middle of the river are being inundated with water in several areas. It is likely that if this vegetation were not in this area, a lot of the materials would wash away. The trees within this island illustrate the ability of vegetation to prevent erosion. Photo 275 is a shot of the southern bank of the river at the water's edge. These steep banks are held in place by limestone bedrock near the bottom and vegetation on the higher portions of the bank. These banks should be inspected periodically.



Photo 273



Photo 274



Photo 275

Photos 276-279 were taken within the Veterans' Memorial Riverwalk area. Photo 276 was taken on the northwestern side of the area and looks to the southeast. Photo 277 is near the lookout deck in the middle of the access area and looks to the northwest. Photos 278 and 279 are from the southeastern side of Veterans Memorial Riverwalk. Photo 278 looks to the northwest. Photo 279 looks to the southeast. Construction has started on the stairs which connect this area with Public Square.



Photo 276



Photo 277



Photo 278



Photo 279

Photos 280-282 were taken from the Court Street Bridge looking upstream to the southeast. The steep banks in this area are shown on both sides of the river. As indicated previously, these banks are stable on the bottom as they are comprised of limestone bedrock. The middle and upper banks soil materials are held in place by vegetation. The vegetated islands mentioned in the previous sections are shown from afar.



Photo 280



Photo 281



Photo 282

Photos 283-285 were taken from Court Street Bridge and look downstream to the northwest. Hole Brothers Wave can be seen from here. Photo 284 shows a launch area that is used for rafters on the northern bank. Portions of the launch area and Hole Brothers Park can be seen from Photos 283 and 285.



Photo 283



Photo 284



Photo 285

Photos 286-290 were taken in the winter, from the northern banks of the river, just downstream of the Court Street Bridge. The photos pan from the east to west and show the steep, heavily vegetated banks in this area.



Photo 286



Photo 287



Photo 288



Photo 289



Photo 290

Photos 291-295 were taken at the Hole Brothers Park which is under construction, but shut down for the winter season. Photo 291 is a view just off of Newell Street which looks down to the west at the former Black River Brewery and the recently constructed parking area. Photo 292 is of the decking area which is under construction. Photos 293-295 were taken at the upstream end of Hole Brothers Park and look to the west at the eroded banks in this area. Photo 294 is a close up shot of the erosion that is occurring on the bank adjacent to the deck area that is being constructed. Photo 295 shows silt fencing that was installed as part of the summer construction project which has nearly been washed away by the higher fall water levels.



Photo 291



Photo 292



Photo 293



Photo 294



Photo 295

Photos 296-298 were taken of stairs that were constructed on the eastern portion of Hole Brothers Park. Photo 296 and 297 show a view of the stairs from the top. The bottom portion of the stairs is washing away due to the erosive effects of the river. Photo 298 is from the bottom of the stairs looking up towards the top. The newly graded, steep bank can be seen in this photo.



Photo 296



Photo 297



Photo 298

Photos 299-302 were taken at the Hole Brothers Park, west of the former Black River Brewery. Photo 299 is of the pedestrian path in this area taken from the deck area of the former Black River Brewery in the northwesterly direction. Photo 300 is from the pedestrian path looking in the western direction. Photo 301 is of a culvert under the pedestrian path which is eroding away at the inlet and outlet. Photo 302 is of the riverbank near the pedestrian path which has been subject to severe erosion. The silt fencing which was installed during construction has been inundated and soils are entering the river.



Photo 299



Photo 300



Photo 301



Photo 302

Photos 303-305 were taken to the northwest of the former Black River Brewery near the access to the Black River. Photo 303 shows the banks in this area eroding away. Photo 304 is taken looking in the westerly direction and shows the lookout area in the distance. Banks in need of erosion protection are shown in Photo 305 adjacent to the deck area which is being added onto the former Black River Brewery.



Photo 303



Photo 304



Photo 305

Photos 306-313 are of the northern banks of the river, across from Hole Brothers Park. Photo 306 was taken in the northeastern direction. Photo 307 is looking to the northeast at an abandoned structure which looks to have been used for power generation at one time. The retaining wall that is part of this structure is beginning to fail. Photo 308 is a close up shot of the failing eastern portion of the wall. Photo 309 is another shot of the wall farther downriver to the west.



Photo 306



Photo 307



Photo 308



Photo 309

Photos 310-313 pan downriver from the failing retaining wall to the west along the northern banks. Photos 310 and 311 are of smaller rock wall retaining structures which are also failing. Vegetation exists along the banks behind the rock wall. Photos 312 and 313 are of the northern banks of the river upstream of the railroad bridge. Abandoned, crumbling structures are seen in the background. The banks along this area seem to be stabilized by the native vegetation.



Photo 310



Photo 311



Photo 312



Photo 313

Photos 314-320 were taken from the railroad bridge east of the Vanduzee Street Bridge. Photos 314-316 were taken from the eastern side of the railroad bridge and show some of the banks upstream. Photo 314 and 315 are of the northern banks of the river, upstream from the railroad bridge. Photo 316 shows a portion of the southern bank of the river in this area. The banks shown in these photos seem to be the typical lower limestone bedrock and the upper soil materials held in place with vegetation. The railroad bridge itself didn't show any obvious damage from erosion. It should still be included in the periodic inspections.



Photo 314



Photo 315



Photo 316

Photos 317-320 were taken from the western side of the railroad bridge. Photos 317 and 318 were taken in the western direction along the southern banks of the river. Photo 319 and 320 are taken in the northeastern direction along the northern banks. A small island exists downstream of the railroad bridge and is another example of how vegetation can keep materials from washing away. The banks in this area appear to be stable.



Photo 317



Photo 318



Photo 319



Photo 320

Photos 321-325 were taken on the upstream side of Vanduzee Street Bridge. Starting with Photo 321 and ending with Photo 325, views pan from northeast to southeast. Both the northern and southern banks of the river can be seen from here. As mentioned previously, the banks in this area appear to be in stable condition because of the ample vegetation holding the upper soil material in place.



Photo 321



Photo 322



Photo 323



Photo 324



Photo 325

Photos 326-331 were taken at the Vanduzee Street DEC Fishing Access Area, just to the northeast of the Vanduzee Street Bridge. Photo 326 is looking in the northern direction at the access area from the bridge. The steep banks of the access area can be seen in this photo. Photo 327 was taken near the parking lot of the access area and looks towards the south. Photo 328 was a similar photo taken closer to the river banks. Photo 329 is a close up shot of the path down to the river's edge. Photo 330 is from the pedestrian path looking upstream to the southeast at the nearby banks. Some erosion is occurring along these banks from pedestrian as well as river erosion. Photo 331 was also taken from the pedestrian path and looks to the south at rip rap that has been placed near the foundation of the bridge structure to protect it.



Photo 326



Photo 327



Photo 328



Photo 329



Photo 330



Photo 331

Photos 332-341 were taken from the western side of Vanduzee Street Bridge. Photos 332 and 333 provide an overall view looking to the northwest. Photos 334-340 are more detailed views of the banks and pan from the south to the north. The lower banks in this area are bedrock while the upper banks are of soil which is held in place by vegetation. Photos 339 and 340 show how rip rap has been placed near the bridge to protect it from erosion.



Photo 332



Photo 333



Photo 334



Photo 335



Photo 336



Photo 337



Photo 338



Photo 339



Photo 340

Photos 341-345 are of the waste site that exists on the southern banks of the river, to the northwest of Vanduzee Street Bridge. This area is labeled on the Overall Plan in Appendix A. Photo 341 and 342 show the lower bedrock banks in the area with debris on the higher banks which is washing away during higher flows. Photos 343-345 show closer views of the materials, including broken thermometers.



Photo 341



Photo 342



Photo 343



Photo 344



Photo 345

Photos 346-349 were taken from the southern banks of the river, east of the Bicentennial Park Area. In general, the banks in this area are bedrock and fairly resistant to erosion. Photo 346 and 347 look downstream in the northwesterly direction. Photo 348 is from the same area and looks upstream to the southeast along the southern river banks. Photo 349 shows some debris which was found in this area which seems to be similar to the aforementioned waste site upstream.



Photo 346



Photo 347



Photo 348



Photo 349

Photos 350-358 were taken from the southern banks of the river, east of the Bicentennial Park and offer views to the northern banks in this area. Starting with Photo 350 and ending with Photo 358, the view pans from upstream to downstream. The steep banks in this area are protected from erosion in most places by thick vegetation. Bedrock lines the lower banks.



Photo 350



Photo 351



Photo 352



Photo 353



Photo 354



Photo 355



Photo 356



Photo 357



Photo 358

Photos 359-362 were taken of the Bicentennial Park and Waterfront Trail System along the southern banks of the river. Bicentennial Park is to be further developed in the upcoming years. Photo 359 was taken on the downstream side of Bicentennial Park looking in the northeastern direction at an access point to the river. Erosion is visible in the path from pedestrians. Photos 360-362 were taken on the northern side of the park. Photo 360 is looking south towards the Ice Arena. Photo 361 is looking southeast towards the river from the park. Photo 362 is looking southwest.



Photo 359



Photo 360



Photo 361



Photo 362

Photos 363-367 were taken along the Waterfront trails that traverse the southern banks of the river from Bicentennial Park to Jefferson Community College. Photo 363 is of an eroding section of one of the trails along the river in the vicinity of the Pollution Control Plant and looks northwest. Note that the erosion in Photo 363 has been repaired at the completion of this report, but still serves to show the general erosion susceptible state of the paths. Photo 364 is of a culvert outfall near the same trail. Concrete outfalls like this prevent erosion. Culverts which discharge significant amounts of water could have rip rap installed to extend closer to the edge of the river.



Photo 363



Photo 364

Photo 365 is a view of a portion of the trail system between the Pollution Control Plant and Jefferson Community College looking in the southeastern direction. A lookout area can be seen in this photo. Photo 366 and 367 were taken along the banks of the river, near a separate lookout from the one in Photo 365. These photos show the general configuration of riverbanks in this area. The lower banks consist of bedrock and the upper banks are of different soil materials which are held in place by vegetation in many areas. Some areas, such as here where there is a lack of vegetation, are more susceptible to erosion during high flow events than vegetated areas.



Photo 365



Photo 366



Photo 367

Photos 368 and 369 were taken near the Kelsey Creek Outlet to the Black River on the northern banks and are looking at the southern banks near the Pollution Control Plant.



Photo 368



Photo 369

Photos 370-374 were taken of the Kelsey Creek outlet to the river. Photo 370 shows the concrete channels which the water flows through. Photos 371 and 372 are also at the outlet of Kelsey Creek and show the gabion baskets and retaining walls that are used to channel water to the river. Photo 373 and 374 are of the northern banks of the river upstream and downstream of the inlet, respectively. This outlet to the river and the nearby banks seems to be in stable condition. This inlet area should be included as part of the periodic inspections.



Photo 370



Photo 371



Photo 372



Photo 373



Photo 374

Photos 375 and 376 were taken from the train tracks near the Kelsey Creek outlet to the river and look in the northern direction. This area is part of the 100 year flood plain. The banks of this stream are fairly stable because of the thick vegetation.



Photo 375



Photo 376

Photos 377-387 offer views of the northern banks of the river, stretching from areas across from the Pollution Control Plant to areas across from the Waterfront Trails at Jefferson Community College. The banks along this area are the lower bedrock river edge and the upper soil materials held in place by vegetation.



Photo 377



Photo 378



Photo 379



Photo 380



Photo 381



Photo 382



Photo 383



Photo 384



Photo 385



Photo 386



Photo 387

Photos 388-392 were taken along the southern banks of the river between the Pollution Control Plant and Jefferson Community College. Photos are generally looking downstream. Most areas are heavily vegetated which prevents significant erosion from occurring.



Photo 388



Photo 389



Photo 390



Photo 391



Photo 392

C) Findings and Recommendations – Existing

Existing access areas within this sub corridor which will be concentrated on are: Veterans Memorial Riverwalk, B.O.B. Rafting Launch Area, Hudson River Rafting Launch Area and the Waterfront Trails near Jefferson Community College. The deteriorating retaining walls, north of the Hole Brothers Wave will also be discussed.

(1) Veterans' Memorial Riverwalk

The Veterans' Memorial Riverwalk itself does not have any significant active erosion areas. There are some spots within this access area that should be monitored as time goes on.

As seen previously in Photos 265-280, this access area is significantly higher than the adjacent river. The resulting steep bank is the sensitive section of this access area. The lower limestone bedrock banking keeps significant erosion from occurring at normal and slightly high water elevations. The higher banks which consist of soil materials which are more susceptible to erosion, have thick vegetation growing on them. This vegetation helps keep these materials in place. There are some outfall culverts in this area which discharge out of the upper banks. Upon visual inspection, these culverts didn't appear to be causing significant erosion. These banks and culverts should be periodically checked as part of an inspection plan. If erosion problems are found, it may be necessary to install rip rap.

(2) B.O.B. And Hudson River Rafting Launch Areas

These two private launch areas are located across from one another, downstream of the Court Street Bridge. They are shown on the Overall Plan included in Appendix A. The B.O.B. Rafting Launch Area located on the northern bank of the river is mainly bedrock and there are no obvious signs of erosion. This launch area is shown from a distance in Photo 284.

The Hudson River Rafting launch area is located in the same general vicinity of the B.O.B. Rafting launch area, on the opposite side of the river. This launch area and the banks in the vicinity can be seen in Photos 286-290. The approach to this launch area is a lot steeper than the B.O.B. Rafting launch area. According to a representative from Hudson River Rafting, the remains of the old Court Street Bridge abutment are close to this launch area and are crumbling apart slowly. The new Court Street Bridge has an area to watch the river from which is fenced off. Due to this, rafters periodically make their way past the crumbling bridge abutment to the viewing area and vice versa. This makes for an unsafe situation when rafters are traversing the bank near this. This existing structure should be removed.

(3) Retaining walls near Hole Brothers Wave

As seen in photos 307-311, a retaining wall exists along the northern banks of the Hole Brothers Wave area which was, at one time, likely part of a power generation facility. These retaining walls and abandoned structures could be repaired and included as part of the access or viewing areas for the Hole Brothers Wave. In any case, the retaining walls in this section of the river are only going to continue to deteriorate and fail, causing a detraction to the Hole Brothers Wave attraction.

Due to situations like this in which private owners are in control of structures that could be useful for improvements along the river, the City of Watertown should consider requirements for maintaining structures along the river. This is discussed further in the recommendations section. This retaining wall and abandoned structure should be included in part of the inspection program for the river.

(4) Waterfront Trails

The trails in the vicinity of Jefferson Community College and the Pollution Control Plant provide a great way for pedestrians to enjoy the river area. This trail system varies from several hundred feet to right up to the banks. Some minor erosion was witnessed in the trails themselves at low points where there were no culverts under the trail. See photo 363, which shows a portion of the gravel trail which has washed out in a low spot. For future trails, asphalt or larger crushed stone should be considered as a base. This would help to prevent washouts.

For existing eroded areas, the erosion can be prevented several different ways. In areas of the trail where minor erosion is occurring, a larger stone trail base may be sufficient. In areas where erosion is severe, it is likely that a culvert needs to be installed. All pedestrian trails along the river should be included as part of the periodic inspection program. Even trails farther away from the river are susceptible to erosion, as channels tend to develop and lead to the river.

D) Findings and Recommendations – Proposed

Proposed access areas within this sub corridor which will be concentrated on are: Hole Brothers Waterfront Loft District, Vanduzee Barns Residential Community and Bicentennial Park Improvements. The following are analyses and recommendations for each of the proposed developments.

(1) Hole Brother's Loft District

The Hole Brothers Loft District is a plan that will hopefully revitalize the areas around the Hole Brothers Wave Area. Improvements to Howk and Newell Streets should make this area enjoyable to visit. The areas immediately adjacent to the Hole Brothers Wave have already begun to have improvements made in the form of the Hole Brothers Park construction. Plans for the park are included as part of Appendix G and are discussed in this section. Figure D, below shows the LWRP sketch plan for this area.

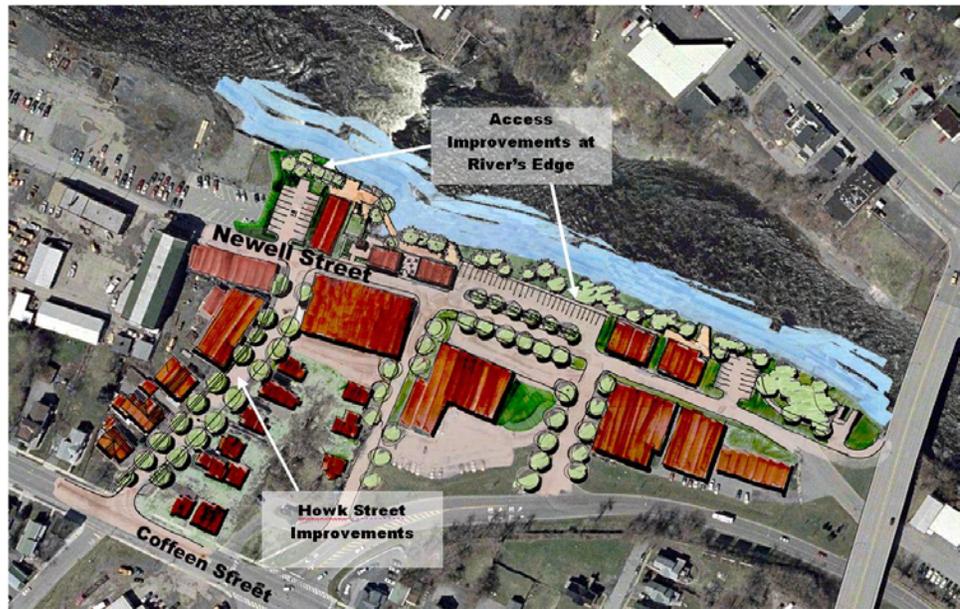


Figure D

General recommendations for this proposed development include being aware of existing vegetation and the erosion protection that it provides. Abandoned structures in this area also provide some drawbacks to this development as well. The abandoned power generation structure directly across from Hole Brothers Park is crumbling and could either be removed completely, or repaired and used to enhance the area. An existing Bridge abutment from the old Court Street Bridge also exists and is crumbling.

As mentioned above, Hole Brothers Park is currently underway and is seen in Photos 286-293. When finished, this should provide another great access area for kayakers and others looking for a good time along the river. Also seen in the aforementioned photos is the significant erosion that is taking place. The construction site has not been stabilized for the winter, and it is obvious that maintenance to the erosion and sediment control devices have not been maintained. The contractor working on this project had silt fencing installed on the edge of the river during the summer to keep sediments from entering the river. These silt fences were almost completely washed away in some cases, as the river was at a higher level when the photos were taken in the Fall.

In addition to temporary erosion and sediment devices being washed away, it was apparent that the soils that were left behind for the winter were attempted to be seeded. The water velocity in this area of the river in combination with the runoff from the land can cause significant erosion. Grass alone will not likely keep the erosion at bay. It may be necessary to install a combination of vegetative and structural erosion controls.

Stairs have been constructed along the bank of the river on the eastern side of the project. These stairs appear to be washing away at the bottom where they come in contact with the river's edge. There should be a more erosion resistant method of installing these stairs. Concrete may want to be considered for the lower stairs which are more likely to see erosive conditions that the upper ones.

The crushed stone along the riverbank side of the stairs is graded to mesh in with the surrounding elevations. A very steep slope has resulted. This combined with the smaller grade crushed stone used, could result in materials eroding away during higher flow situation which are bound to occur. It is recommended that steep slopes such as this have rip rap installed on them to prevent the material

from eroding away. See section I.F.2 on structural erosion control measures. According to the design drawings provided by the City of Watertown and attached in Appendix G, existing vegetation was in place along the banks of the river before construction started. This vegetation has since been removed. By removing this vegetation, natural erosion controls were removed. It is important to keep in mind that when developing along river banks that were vegetated to start with, to make measures to keep the banks stable.

This site is an example of why the City of Watertown should include requirements for periodic erosion inspections on sites that are under construction, when within a short distance of the river, even if not required by the NYSDEC. Furthermore, development plans should be checked closely to verify that the proper permanent erosion control techniques are employed along the banks of the river.

(2) Vanduzee Barns Residential Community

The Vanduzee Barns Residential Community is a development that will hopefully provide many people with a great place to live. Along with converting the old DOT barns on this site into residences, this project includes improving the landscaping and access to the river. The vision for the property is a unique waterfront residential development with public shoreline and greenway. Retail and office space may also be added to create a mixed-use community. Figure E below is a sketch plan of the Vanduzee Barn Residential Community from the LWRP Plan.



Figure E

Photos 316-318 are of the northern banks in the vicinity of the proposed Vanduzee Barns Residential Community. These photos were taken during the summer. Photos 393-397 were taken in the winter months from the upstream side of Vanduzee Street Bridge and show the grades of the banks better, as the view is better without foliage. The photos pan from west near the fishing access area to the east near the railroad bridge.



Photo 393



Photo 394



Photo 395



Photo 396



Photo 397

The photos above show how vegetation can prevent banks from eroding away. It will be important when developing this site, to maintain as much of the existing vegetation as possible. If vegetation needs to be removed along the banks to provide for trail and viewing areas, erosion controls may be necessary. The lower banks are of bedrock, but the upper banks are soils which are erosion susceptible without appropriate vegetation. This area may be a good candidate for the use of the stepped rip rap which doubles as pedestrian seating areas as shown in the LWRP plan.

As discussed in other sections, the recommended pedestrian path material is asphalt, as it is resistant to erosion. If this is not an economical feasibility, a larger sized crushed stone than was used on other City access areas should be considered. This material may not provide the ideal walking surface, but it will resist erosion much better than pea gravel, which was used in other pedestrian pathways and eroded away.

(3) Bicentennial Park Improvements

Bicentennial Park is an existing park along the river. Since improvements are slated for it in the near future, it is being considered as a proposed feature. The improvements include providing additional trails along the river and a pavilion area as shown on the design drawings included as Appendix G. Recommendations will be made on how to avoid erosion during and after construction.

In addition to hurdles that must be overcome as part of the construction process, existing areas near Bicentennial Park should be considered for additional improvements. Just upstream from the proposed Bicentennial Park is a small waste site which should be cleaned up as shown in Photos 341-345. Erosion has gradually undermined the upper banks in this area during high flows and has unearthed a dump site from the past. Especially with a newly improved park nearby, pedestrians are bound to venture into this area where unsafe materials were discovered, including broken thermometers. Once this site is environmentally cleaned, it should be considered for erosion control. Note that not all of this waste site is on City of Watertown property. (See Overall Map 1 in Appendix A)

During construction erosion controls are shown on the design drawings for the Bicentennial Park improvements. Periodic inspections should be performed on sites under construction as recommended previously in the evaluation of the Hole Brothers Park improvements to determine if the erosion controls that were called out for during construction activities are effective.

As noted previously, the pedestrian trails that have been called out in other areas along the river generally have dust gravel as the material. Evidence has shown that this type of trail design is susceptible to erosion. It is recommended that either asphalt or crushed stone materials be used as a top course, as they are more resistant to erosion.

D. CRITICAL VANTAGE POINTS

Critical Vantage Points are areas along the river which offer dramatic and encompassing views of the river. The Critical Vantage Points will allow one to see how the river changes from season to season. It will also hopefully provide some understanding of how the river acts under flood stage by indicating recorded flow quantities for the dates that photos were taken.

The areas utilized for the Critical Vantage Points (CVP's) were: an area off of Ridge Road in the Town of Watertown which provided views of the Eastern Islands Area, Route 3 Fishing Access and Car-Top Launch Area, Route 3 Bridge, Pearl Street Bridge, Mill Street Bridge, Court Street Bridge and Vanduzee Street Bridge. These Critical Vantage Point Areas are labeled on the Overall Map in Appendix A as "CVP".

The Critical Vantage Point photos were taken on three separate occasions: 4 March 2008, 15 April 2008, 30 June 2008 and 3 September 2008. The photo dates will be indicated by A, B, C, and D on the photo tags, respectively. The recorded mean discharges for each of these dates from the USGS National Water Information System at the Vanduzee Street recording station are: 3,920 CFS, 22,500 CFS, 5,110 CFS, and 1,750 CFS, respectively. For comparison purposes, the highest recorded peak streamflow on record was on 10 January 1998 and measured 55,500 CFS, more than double the flow which occurred during the 15 April 2008 CVP photos. On 12 April 1993, the peak streamflow was measured at 42,600 CFS. Scanned photos of some areas are shown from this date for reference in Appendix E.

1. Ridge Road CVP's

The Ridge Road CVP's are taken in the location shown on the Overall Plan. CVP 1 is looking in the northwestern direction. CVP 2 was taken looking in the northeastern direction.



CVP 1A



CVP 1B



CVP 1C



CVP 1D



CVP 2A



CVP 2B



CVP 2C



CVP 2D

2. Route 3 Fishing Access and Car-Top Launch CVP's

CVP's 3 and 4 are taken from the Route 3 Fishing Access and Car-Top Launch Area. CVP 3 looks in the eastern direction at portions of Huntington Island and the southern banks of the river. CVP 4 looks to the southwest at portions of Delano Island and banks in the vicinity of the Route 3 Dam.



CVP 3A



CVP 3B



CVP 3C



CVP 3D



CVP 4A



CVP 4B



CVP 4C



CVP 4D

3. Route 3 Bridge CVP's

CVP's 5 and 6 are taken from the Route 3 bridge. CVP 5 looks upstream to the east at the dam in this area. CVP 6 looks downstream to the west at the Route 3 Wave.



CVP 5A



CVP 5B



CVP 5C



CVP 5D



CVP 6A



CVP 6B



CVP 6C



CVP 6D

4. Pearl Street Bridge South

CVP's 7 and 8 are taken from the southern portion of the Pearl Street Bridge. CVP 7 includes views of the upstream to the east. CVP 8 looks downstream to the west.



CVP 7A



CVP 7B



CVP 7C



CVP 7D



CVP 8A



CVP 8B



CVP 8C



CVP 8D

5. Pearl Street Bridge North

CVP's 9 and 10 are taken from the northern portion of the Pearl Street Bridge. CVP 9 includes views of the upstream to the east. CVP 10 looks downstream to the west.



CVP 9A



CVP 9B



CVP 9C



CVP 9D



CVP 10A



CVP 10B



CVP 10C



CVP 10D

6. Mill Street Bridge

CVP's 11 and 12 are taken from the northern portion of the Mill Street Bridge. CVP 11 includes views of the upstream to the east. CVP 12 looks downstream to the west.



CVP 11A



CVP 11B



CVP 11C



CVP 11D



CVP 12A



CVP 12B



CVP 12C



CVP 12D

7. Court Street Bridge

CVP's 13 and 14 are taken from the Court Street Bridge. CVP 13 includes views of the upstream to the southeast. CVP 14 looks downstream to the northwest.



CVP 13A



CVP 13B



CVP 13C



CVP 13D



CVP 14A



CVP 14B



CVP 14C



CVP 14D

8. Vanduzee Street Bridge

CVP's 15 and 16 are taken from the Vanduzee Street Bridge. CVP 15 includes views of the upstream to the southeast. CVP 16 looks downstream to the northwest.



CVP 15A



CVP 15B



CVP 15C



CVP 15D



CVP 16A



CVP 16B



CVP 16C



CVP 16D

III. **RECOMMENDED ACTIONS**

Based on the findings of this report, actions to be considered by the City of Watertown have been compiled. These actions to be considered include a listing of areas in need of erosion controls and the severity of each, implementing new inspection programs along the river, educating those who live and work along the river about erosion, creating zoning and site plan approval requirements which would help to prevent erosion along the river, identifying effective emergency erosion control measures and creating a River Design Manual which would require certain erosion controls and construction methods to be employed when in close proximity to the river. Each of these actions to be considered will be discussed in detail in this section.

A. CATEGORIZED EROSION AREAS

Areas of the riverbanks which have been eroded away have been pointed out and had general recommendations made in the River Inspection and Analysis portion of this report. It is important to group these recommendations into order of importance, as each one has a differing degree of effect on its surroundings, whether it be on property or people.

The recommendations for specific areas have been categorized based on their severity and fall into category one, two or three. Category one erosion includes areas that are slightly eroded and are not having a large impact or potential for a large impact on the surrounding environment. Category two erosion includes areas that are mildly eroded and are having or have the potential to slightly effect the surrounding environment. Category 3 erosion includes areas that are severely eroded and are having or have the potential for severe effects on the surrounding areas. These categorized erosion areas are also listed in order of importance of being addressed.

1. Category One Erosion Areas

This section contains a listing of category one erosion areas. These erosion areas are ones that could use attention but it is not required. The areas are as follows:

- Eastern Islands Erosion Area (Huntington and Delano Islands)
- Route 3 Wave Access Area – Pedestrian Path Erosion
- Water Works Park Pedestrian Erosion
- Huntington Street Outlet near Diamond Island
- Sewall's Island Car-Top Launch Access Area Pedestrian Erosion
- Vanduzee Street DEC Fishing Access – Minor Erosion
- JCC Waterfront Trails – Minor Erosion

2. Category Two Erosion Areas

This section contains a listing of category two erosion areas. These erosion areas are ones that are of moderate importance. The areas are as follows:

- Route 3 Dam Structure Erosion
- Water Filtration Plant Deteriorating Structures
- Eroding Banks Across from Water Works Park
- Retaining Wall undermining near Chapin's
- Sewall's Island Bank Erosion
- Retaining Wall Across from Hole Brothers Park
- Water Street Erosion Area near Hydroelectric Facility
- Railroad bridge foundations near Pearl Street (structural inspection if going to be used for pedestrian bridge)
- Beebee's Island bank evaluations (for future development plans)

3. Category Three Erosion Areas

This section contains a listing of category three erosion areas. These erosion areas are ones that should be mitigated first. The areas are as follows:

- Route 3 Wave Loose Boulders (Appendix F)
- Pearl Street Bridge North Pipe structure foundations (structural inspection)
- Abe Cooper Access Area Erosion
 - Pedestrian Paths
 - Crumbling Structures
- Dealmaker Body Shop Eroding Bank
- Waste Site near Bicentennial Park
- Old Court Street Bridge – Crumbling Bridge Structures
- Mill Street Bridge South – Structures along river in need of structural inspection

B. INSPECTION PROGRAMS

The City of Watertown could consider creating special inspection requirements for developments along the Black River. The Black River banks within the LWRP boundaries could be periodically inspected to determine the condition of erosion controls and other features. Construction sites that are in the vicinity of the Black River within the City limits which are normally not required to perform inspections should be required to do so. Furthermore, construction sites which are greater than one acre of disturbance are required to perform inspections, as required by NYSDEC regulation. Construction sites under the one acre limit, but within the LWRP boundaries should be required to adhere to these same regulations. It should be noted that these inspection recommendations are intended to be put in place when jurisdictional laws allow. Even though the City may not be in a position at this time to put requirements in place as follows, there may come a time when they are allowed.

1. Periodic Overall Riverbank Inspection

A lengthy riverbank inspection was conducted for this project and helped to reveal some erosion areas that may not have been known about. The conditions of the river can change rapidly and therefore should be re-inspected at regular intervals to determine if additional erosion controls are required. These inspections could be performed by the City of Watertown or hired out to a private firm and be performed at least once a year. The inspections could be performed during the summer to evaluate the banks at more revealing low water levels. Areas recommended to be inspected have been mentioned throughout the inspection sections of this report and have been indicated on the Overall Map in Appendix A.

2. Construction Inspections

In addition to a yearly inspection of the riverbanks, the City of Watertown should consider requiring inspections on construction sites that are close to the riverbanks. Construction sites along the riverbanks tend to decrease resistance to erosion as existing protective vegetation is usually removed. The decreased resistance to erosion in these areas close to the river can lead to washouts or bank failures if proper controls are not implemented. The riverbank inspection has shown how construction sites that have been shut down for the winter can become heavily eroded by several sources of erosion.

In general, construction sites that are greater than one acre of overall disturbance are required by NYSDEC regulation to have a Storm Water Pollution Prevention Plan (SWPPP) prepared. This plan lays out temporary and permanent controls which help

prevent erosion. In addition, inspections are required to be performed which are funded by the owner. Sites less than one acre of disturbance are usually exempt from this. If sites are found by the NYSDEC to be contaminating surrounding waters with sediment or other harmful substances, fines could be issued.

During the visual inspections, some construction sites were discovered which appeared to be lacking, as far as erosion controls are concerned. The City of Watertown should consider enforcing NYSDEC regulations to avoid having any fines come back to them and to protect the river. The SWPPP inspections that are required to be performed on the larger sites, greater than one acre, could be expanded to smaller sites that are within a setback limit from the river. Pre-construction, during construction, and post-construction inspections would be required. Additional, appropriate inspection requirements could be formulated to protect the river from eroding construction sites.

A) Pre-Construction Inspections and Meetings

Pre-Construction inspections can head off potential problems before they ever start. A pre-construction meeting could be held with the owner, inspector and contractors to stress the importance of the erosion issues near the river. The design drawings could be reviewed to see if anything looks as if it may be problematic.

B) During Construction Inspections

During construction inspections would allow inspectors to determine if erosion controls are performing as designed. Inspectors would be required to visit sites a minimum of once every two weeks to determine the effectiveness of the erosion and sediment controls. The construction of the features on the site could also be inspected to determine if they were being installed correctly. Proper planning could be promoted and verified by the inspector in cases such as reminding the contractor to plant the grass in time for it to be established. Sometimes the most obvious things get overlooked. When a site is to be shut down for the winter, an inspector would be required to approve the condition of the site as being stabilized.

C) Post-Construction Inspections

When construction is complete on a site, a final walkthrough would be performed to determine if all items on the approved drawings had been constructed properly. A springtime inspection would also be required to evaluate how the erosion controls performed over the winter and whether modifications to the erosion controls are necessary.

C. EROSION EDUCATION

Many residents and land owners that live and have properties along the riverbanks know little about preventing erosion or why it is important to do so. It is recommended that the City of Watertown have a short document prepared which can be handed out to landowners along the river which informs them about erosion. The document could have information on vegetative and structural erosion controls and how they prevent erosion. Information which shows how property can be eroded away may be helpful. Additional direction could be included for those who may want to make improvements along the river. Some residents try to cut back vegetation along the water to open up the view from their property and inadvertently create an erosion problem. In cases like this, it would be useful for them to know that replanting of alternative vegetation or installation of structural erosion controls is necessary. Sample documents from other municipalities and organizations have been attached as part of Appendix H.

D. RIVER REGULATIONS

Regulations put in place by municipalities can help to prevent damage to properties. The City of Watertown should consider enacting some regulations which limit certain activities near river banks that are susceptible to erosion. Some examples are given below:

1. Setback Requirements

Some structures have been built in the past which are now having a negative effect on the riverbank. Developments that have built structures close to the banks of the river are experiencing bank failures to a certain degree. The City of Watertown should consider adding zoning requirements to help prevent this from happening. Setback and other requirements which relate to vegetation along the bank could be considered. Certain setbacks could be waived by the Zoning Board of Appeals (ZBA) if bank conditions were stable enough, based on input from the Engineering Department. Examples of municipal codes that were proposed or adopted have been attached as Appendix I. Note that at the time of completion of this report, river zoning setbacks were being proposed by the City of Watertown Planning Department.

2. Maintaining Historic Structures

Some privately owned properties along the river are home to historic structures which are deteriorating in condition and act as “eye sores”. These structures could add to the river’s attractive appearance if they were converted to viewing areas or returned to a stable state. Much like municipal requirements which mandate lawns be kept to a certain height, new zoning regulations could require that land owners keep historic structures in a stable and clean state. In certain cases, the City could be given the option of taking over the structures for improvement and public access.

E. DESIGN STANDARDS

Municipalities generally have certain design standards that are required to be adhered to when developing a set of plans. The City of Watertown could consider developing a Black River Design Manual or something similar to require certain types of structures along the river when legally appropriate for all parties involved. Details of paths, land grading, inspection methods and requirements, and other pertinent activities could be called out in the design manual. This could be included as part of the City’s Site Plan checklist.

If additional efforts were put into this manual, recommended types of erosion control structures could be called out. As mentioned previously, velocity plays a very big role in deciding the types of erosion control in an area. If cross sections of the river were surveyed by the City or a private firm, it would help to determine what the design velocities in certain areas of the river are. This could save river developers from doing site specific analyses and “reinventing the wheel”.

Smaller scale items such as pedestrian trails along the river banks could be called out. Stone dust trails that have been called out on recent projects could be upgraded to include more erosion resistant materials such as asphalt or crushed stone that is to be compacted when the paths are out of erosion areas. Other trails along the riverbank which could be inundated with water could be called out as laid stone with mortar between to provide a long lasting, erosion resistant walking surface. This would also help match the look of the parks and trails around the area.

F. PREVENTATIVE AND EMERGENCY MEASURES

The flooding events in 1993 and 1998 prove that emergency flooding events are bound to occur. Even when there isn't a plan in place on what to do in these situations, people often work together and rise to the task at hand. It is recommended that an emergency erosion management plan be formulated to determine what types of erosion and flooding controls work quickly and effectively. This would likely include such things as the DPW superintendent's approach to building a berm out of a combination of run of bank gravel, plastic and topsoil. Sand and bags could be left on hand for emergency use.

Many areas which were washed out during the 1993 and 1998 storms were repaired to their original state before the flooding. This approach does solve the problem for the time being, but when the next significant storm event does come along, it is likely to wash out again. A proactive approach would be to upgrade areas of washouts to a more resistant form of erosion control.

IV. CONCLUSION

The Black River is a great asset to the City of Watertown and surrounding areas. The rivers great views and potential for activities draws a large number of people to the area. Although there is a great interest in the river now, it has much more potential, as only portions of the riverbanks are open for access. In opening up additional areas for access, it is important to realize the effects that erosion can have. GYMO, P.C. believes that if the recommendations made in this report are implemented, it will result in a better overall experience for those that enjoy the river while also preventing erosion resultant problems from occurring.