Blackstone Gateway Park

Master Plan Report

January 2004

Prepared For:
The Greater Worcester Land Trust and
The City of Worcester, MA

Prepared By:
TerraSphere, Inc.
Worcester, MA
In conjunction with
The BSC Group and
GZA Environmental

Blackstone Gateway Park
Master Plan Report January 2004

TABLE OF CONTENTS

ATTACHMENTS:

I. FIGURES

Site Context Diagram
Study Area Diagram
Aerial Photograph
Parcel Ownership Diagram
Historic Features Diagram
Existing Topography Diagram
Slope Analysis Diagram
Circulation Diagram
Vegetation Diagram
Site Ecologies Diagram
Trail Location Alternatives Option 1
Trail Location Alternatives Option 2
Trail Location Alternatives Option 1 over Aerial Photograph
Trail Location Alternatives Option 2 with Slope Analysis
Trail Location Alternatives Option 2 with Vegetation Diagram
Illustrative Master Plan

II. Inventory of Natural Features and Plant and Animal Species

III. Soil Boring Data

III. Helical Pier

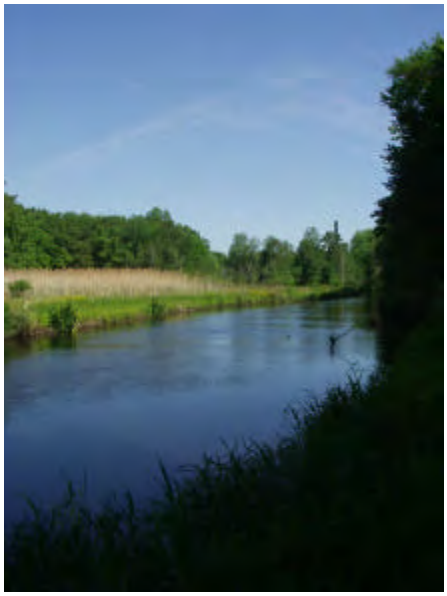
V. HDPE Decking

VI. Floating Docks

VII. Cable Railing

VIII. Soil Stabilizer

1.0 PROJECT OVERVIEW



View north up river

This Master Plan for the Blackstone Gateway Park was initiated by the Northern Gateway Recreation Sub Committee of the Blackstone Valley Northern Gateway Visitor Center Task Force to build upon the success of the Blackstone River Valley National Heritage Corridor and its linkage into Worcester. Once implemented, the actions recommended within this Master Plan will provide an important link from the Blackstone River to a major open space amenity within Worcester. This open space amenity, consisting of the undeveloped Middle River Park and adjacent conservation land, is to be enhanced with walkways, boardwalks and canoe access to create a dynamic mix of open space resources, nature education opportunities and historic preservation. Furthermore, these trails, boardwalks and river access points will be linked to surrounding neighborhoods, institutions, the Blackstone's Northern Gateway Visitor Center and Blackstone Bikeway to further enhance and expand the benefits of each of these elements to the abutting community.

The proposed Blackstone Gateway Park is located approximately three miles south of the Worcester Downtown Business District on the edge of the "Quinsigamond Village" neighborhood. (see Site Context and Study Area Diagrams and Aerial Photograph). The name, Quinsigamond, is derived from the Native American words Qunnosu, meaning, "long nose" (or pickerel) and Amaug meaning, "fishing place," or "Pickerel Fishing Place." The Southern portion of

the site is located where the Millbrook daylights from a conduit, joining with the Blackstone River from the west. This occurs just south of the old "Mill Pond Dam" located at the junction of Millbury Street and the P&W Railroad Bridge. This open space resource is in a high visibility urbanized area at the gateway of Route 146, so its development is a significant visual and recreational resource for all of Worcester.

Proposed location for Northern Gateway Visitor Center (former Washburn and Moen Wire Rope Factory and Rome Building)

Due to its prominent and highly visible location, creating the Blackstone Gateway Park Master Plan has been a vision for the city of Worcester for over a decade. An initial conceptual plan and implementation strategy for the Blackstone River Canal Heritage State Park was prepared for the Department of Environmental Management in 1988. The resulting plan and report concluded that the land adjacent to the Blackstone River at the intersection of Ballard Street (Route 146) and Millbury Street would be an ideal location for the Blackstone Gateway Visitor Center and an associated passive recreation park. This location is at the headwaters of the Blackstone River Valley National Heritage Corridor and Blackstone River Bikeway. Remnants of the Industrial Revolution can be seen along the banks of the Blackstone River as it snakes its way through 46 miles of countryside from Worcester, Massachusetts to Providence, Rhode Island. The Blackstone River Bikeway has already been designed and portions constructed.

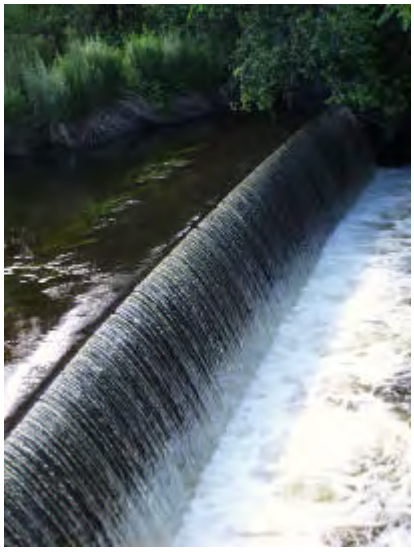
Now, for this Master Plan, the Greater Worcester Land Trust and the city of Worcester, on behalf of the Northern Gateway Recreation Sub Committee, enlisted the services of TerraSphere to develop this comprehensive Master Plan for the Blackstone Gateway Park. A major component of this Master Plan is to provide for public access through the site while preserving sensitive environmental areas and linking the site to the Visitor Center, local community and the Blackstone River Bikeway. To develop this Master Plan, TerraSphere created a plan for the riverfront area that can be embraced by the property owners, interested parties and the community. Furthermore, the plan is technically feasible through the recommendation of construction materials that are appropriate to the site and are durable.

View toward dam and railroad bridge from southern shore

Key components of this Master Plan for the Blackstone Gateway Park include:

- an environmentally sensitive boardwalk through wetland areas,
- overlook viewing platforms at strategic intervals along the trail with informational signage for wetlands and river education,
- site-responsive compacted earth trails at a variety of challenge levels,
- canoe launch areas,
- interpretive kiosks emphasizing local and natural history of the area,
- three river crossings proposed with a vital crossing at the historic milldam at the southern end of the site,
- an improved bikeway and pedestrian path along McKeon Road that links both ends of the park along a city street with overlooks down to the river,
- linkages to the Blackstone Bikeway and proposed Visitor's Center site and
- opportunities for "outdoor classrooms" and environmental education programs.

2.0 PROJECT GOALS AND ELEMENTS



Mill Pond Dam at south end of site

The purpose of this study is to develop a Master Plan for the Blackstone Gateway Park to provide public access into an environmentally sensitive area that is unique to an urban environment such as Worcester. This plan will show a balanced design that integrates a handicap accessible trail and boardwalk system that responds to site topography and ecology.

The goal for this planning effort is not to simply create a wonderful plan. Rather, the planning process was used as an opportunity to bring together individuals, citizen groups and organizations committed to a shared vision to:

- provide an exciting open space, people-oriented amenity for Worcester;
- preserve and interpret the ecology and wildlife of this area;
- preserve and interpret the historic development of this area;
- to build upon the many positive initiatives along the Blackstone River Corridor, and
- to present a coherent Master Plan that provides the framework for the phased implementation of improvements over time;

To achieve this vision for the Blackstone Gateway Park, the Master Plan incorporates a number of elements as follows.

Site Sensitive Design

View into wetland from eastern bank

A fundamental objective for this project is to create a dynamic trail and boardwalk system that is uniquely responsive to its surroundings and is visionary in its character. Furthermore, development within the site must be undertaken with minimal impact to the environment. This can be achieved through the application of simple, sensitive design concepts and construction techniques that unify and establish the overall image for this environmentally rich area. Furthermore, the development of this Master Plan included exploration of boardwalk, walkway and bridge construction techniques that are environmentally sensitive. As a highly visible amenity for Worcester residents, schools and adjacent institutions, education and interpretation features are key components of the park planning efforts. In this light, signage and opportunities for educational and research access are addressed, as well as site amenities and products to accommodate various users. (see Attachment IV).

Preservation/Conservation

Geese enjoying the river

Many steps have been taken to help preserve the natural features, vegetation and wildlife in the Gateway Park. See the Existing Topography, Slope Analysis, Vegetation and Site Ecologies Diagrams and Appendix II for an analysis and inventory of existing natural resources. All of the trail systems respond to the natural topography of the site, and any wetland or river crossings take place at stable areas. (see Attachment III for soil boring data.) Raised boardwalks rest on helical pier systems with little impact to the surrounding vegetation and soils. Helical piers are more environmentally sensitive because they are driven into the ground using hand equipment or equipment mounted on a small, rubber-tread Bobcat, yet are extremely stable and reliable support structures. (see Attachment IV). Wildlife and vegetation are scarcely disturbed using these less destructive construction methods than some conventional installation techniques that use large, noisy equipment and require soil excavation.

Integration with other Heritage Parks in the Blackstone Corridor

Existing conditions looking north on McKeon Road near College of the Holy Cross entrance

There will be a direct connection between the final leg of the Blackstone River Bikeway and the Northern Gateway Visitor Center. While the bikeway itself will not enter the Blackstone Gateway Park, a link will be provided along the western edge of the park along McKeon Road. This link will be in the form of an improved bike trail and pedestrian trial along this street, with areas where the trails will enter the park at the top of the hill overlooking the river. Whether by vehicle, bicycle or foot, guests to the Visitor Center will have ample opportunity to explore the park as pedestrians.

Interpretation and Education

View into wetland area

This urban oasis affords multiple opportunities to educate. Whether the audience consists of school children, college students or local residents, the natural resources provide opportunities to learn about wetlands, aquatic biota, flora and fauna. In addition to the ecosystem and habitat resources, historic resources are equally impressive. Early Native American history can be conveyed while providing information about early English settlers. Remnants of early industry are evidenced in the existing

retaining wall and dam used to flood the river for waterpower use. The building to be rehabilitated for use as the Visitor Center holds significant history as a legacy of the American Industrial Revolution.

Recreation

Trail user on existing path

Integrated trail improvements are a positive way to link neighborhoods and provide passive recreational opportunities for a variety of users. The proximity of this site relative to the proposed Visitor Center, Quinsigamond Village and Vernon Hill neighborhoods bolster the significance of creating safe opportunities to connect these entities.

The variety of terrain and natural features are sure to please hikers and pedestrians alike. The park will be open to pedestrian users only, but bicyclists will be accommodated via a proposed bikeway along McKeon Road.

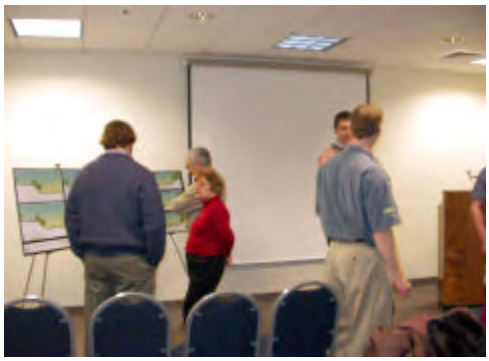
Vegetation along western edge of wetland

Access

Entrance to College of the Holy Cross on McKeon Road

As a recreational amenity for the city and surrounding area, pedestrian access and connections are integral to overall design quality and responsiveness. Providing pedestrian connections to the College of the Holy Cross, Quinsigamond Village and various area bikeways will further solidify the importance of this park as part of a positive growth strategy for the region. In light of the parking and roadway improvements recommended adjacent to this project area, it is essential to design improvements that create safe areas for pedestrian and bicycle movement. Crosswalks and sidewalks have been integrated into the final design in conjunction with the recommended improvements to Route 146 and McKeon Road. Therefore, the proposed Visitor Center and connection to the Blackstone River Bikeway are vital for successful integration into the overall fabric of the area and city.

Public Participation



Public participation at December 2002 informational meeting

Generating a shared vision for the future requires encouraging public participation to ensure that the planning process is inclusive and energetic. For this plan, key stakeholders adjacent to the site and the larger community have

been engaged so that the resulting recommendations can be fully supported and implemented. Property and business owners, residents, planning/design professionals, community leaders, elected officials, and cultural and historic groups have been involved.

Implementation

Knowing that the implementation of this Master Plan will take significant funding and time, the Master Plan was developed with the understanding that it will be implemented in phases. The final section of this report indicates smaller projects that can be implemented separately and stand alone, knowing that they will ultimately be integrated into a larger public access system. A final task includes an estimation of construction costs so that fundraising can happen in a timely manner and construction can take place in harmony with the Visitor Center construction and the Blackstone Bikeway installation.

3.0 HISTORY

Remnants of historic dam wall

Early history indicates that Native American Nipmuck tribes fished the waters of the Blackstone River and its tributaries and lived on their shores. Although there are no known Native American encampment or fishing sites within the park area, such activities probably did occur in or within close proximity of the site. Following European settlement, innovative mill owners harnessed the power of these same rivers throughout New England during the rise of the American Industrial Revolution. Waterways were channeled, as in the Blackstone Canal, and dammed, as in the Middle River mill pond dam at the southern end of the site, to increase the volume of power created by an accessible renewable resource. Worcester's forefathers created viable businesses, employed thousands and constructed the foundation of modern technology and innovation on the banks of the Blackstone River. In the early 1800s, the Blackstone Canal was constructed from Worcester to Providence, Rhode Island as a commercial shipping artery. The canal was actively used from 1828-1848. Due to this accessible waterway, Worcester was once known as a thriving port city. Around the same time, a dam was built on the site to create a mill pond that provided water power to the various mills that eventually located in this area.

Existing raceway wall at southern end of site

An 1886 historic map shows the Washburn and Moen Manufacturing and Quinsigamond Iron Works as early occupants at the southern end of the site. (see Historic Features Diagram).

However, these industrial businesses eventually relocated. At some point, the height of the mill pond dam was lowered, reducing the size of the mill pond behind it. As a result, a vast amount of wetlands, which was once under water, remained along the sides of the river, containing sediment that had settled from the mill pond use. In the 1970s, a portion of the site along McKeon Road was purchased for park purposes, and is known as Middle River Park. The land was never developed, and remains as an undeveloped piece of land. At one point, the City used the land to deposit considerable amounts of snow collected from city streets, which was then allowed to melt into the river. However, that activity ceased in the 1980's due to environmental concerns. In 1999, another portion of land was deeded to the Worcester Conservation Commission by the Riley Stoker Company, who kept ownership of its remaining property and manufacturing facility in the middle of the site close to Interstate 290. The deed for this land specifically states that this "land shall be used by the grantee solely and exclusively as part of the Blackstone River and Canal Heritage State Park."

Arched dam wall in summertime

With this large amount of environmentally sensitive land now in public ownership, the City of Worcester and the Greater Worcester Land Trust initiated plans to integrate this property into the larger Blackstone Valley Corridor and the proposed Northern Gateway Visitor Center. This Master Plan is the beginning of the next chapter of use for this valuable property.

4.0 EXISTING PROJECT CHARACTERISTICS

View into site showing various vegetation and ecology types

The property offers a wonderful oasis of native vegetation contained within a dense urban area. Once one enters the site, a visitor feels cut-off from the sights and sounds of the surrounding urban activities. The site contains a wonderful mix of vegetation, wildlife, ecosystems, vistas, water features and historic elements. It truly is an urban oasis worthy of being protected, preserved and enjoyed by the public. The Project Area currently sits vacant but for a few squatters and occasional curious students looking for a shortcut. A wetland system was created when the dammed river was allowed to flow freely once the waterpower was no longer needed for industrial purposes. Remnants of the old mill pond retention area still exist, as does the skillfully arched dam wall. The following section describes the characteristics of this land, as well important adjacent features, in more detail.

4.1 Project Area Description and Boundary

The site where the Blackstone Gateway Park will be established totals twenty-nine (29) acres of vegetated land owned by the City of Worcester, Conservation Commission and the Department of Parks, Recreation and Cemeteries. This acreage is located to the north of McKeon Road and consists of the Middle River Park and property recently deeded to the Conservation Commission. For the purposes of this study, the area around the site was incorporated into the study in order to accommodate connections to abutting property, projects and neighborhoods.

The Project Area is bounded on the northeast by Dryden Oil property and the Providence and Worcester Railroad that parallels Millbury Street (Route 146). The historic dam provides the southeastern boundary near the intersection of Millbury Street and McKeon Road. The entire southwestern border runs along McKeon Road and terminates at Interstate 290. Property owned by Babcock Power is located in the middle of the study area and separates the larger southeast part of the project area from a smaller area next to Route 290 to the west.

4.2 Topography

Site showing variety of terrain

The site offers an interesting array of terrain. (see Existing Topography and Slope Analysis Diagrams). From southwest to northeast, steep grades on the western side along McKeon Road slope between five and twenty-five percent down to the relatively flat wetlands and river area below, at. an approximate elevation of 442 feet. Part of the terrain drops a mere eight (8) feet, while the peak elevation falls 54 feet to the grade below. The flatter area spans between 120 and 260 feet until sloping back up to the railroad or adjacent properties to the east. From the southeast to northwest the slope is relatively stable except along the northwest sloping area where it rises and falls along McKeon Road from an elevation of approximately 450 to 490 feet, with a peak elevation of approximately 497. Along McKeon Road the difference in elevation from top to bottom, on either end, averages 38 feet. Due to the steep slopes found along the edges of the site, access is best from the north and south ends of the site,

such as by the mill pond dam and Babcock Power parking lot, where handicap accessible grades are possible.

Once within the site, there are many options for locating a relatively flat trail and boardwalk system. The only area where grades may be an issue is in making a connection from the river area up to McKeon Road in order to connect to the College of the Holy Cross. Relatively steep slopes here may require a switch-back ramp placed into the slope to accommodate handicap access.

4.3 Existing Site Ecologies

The site ecologies diagram represents four distinct ecological systems that are unique in this urban context. (see Site Ecologies Diagram). The four ecological types are: forested riparian streambelt, floodplain forest, open marsh and upland forest.

Streambank vegetation with forested vegetation in background

A forested riparian streambelt possesses these qualities:

- Typically narrow (100 ft. or less)
- Vegetation type influenced by proximity to the water
- Vegetation typically water tolerant
- Typically serve as migratory pathways for wildlife
- They provide shelter, food, and access to water
- Habitat well established with 30-40 year-old trees, 50-60 feet in height

A floodplain forest possesses these qualities:

- Habitat located within the 100 year floodplain
- Floodplain is generally well established with trees 30-40 years old and 50-75 feet in height
- Less than 1200 feet in length and 200 feet wide
- Isolated by surrounding development
- Floodplain forests exhibit abundance of seasonally wet woodland pockets

An open marsh possesses these qualities:

- Habitat occurs within the 100 year floodplain
- Contains area 300 feet wide over 2,000 feet long of cattail marsh
- High quality of the northern open marsh supports wildlife more typically associated with non-urban landscapes

Finally, an upland forest borders a floodplain but is located above the banks of a river. Plant and animal species vary greatly depending on the surrounding conditions and level of previous disturbance. An inventory of natural resources found within the property in 1988 can be found in Attachment II. This inventory also includes animal species, which comprise mammals, amphibians, reptiles and fish.

4.4 Existing Vehicular and Pedestrian Access

There are currently no intended vehicular or pedestrian access points directly into the site. (see Circulation Diagram). The site is, however, prominently located off of major roadways such as Route 146 and Interstate 290, with local access from Millbury Street and McKeon Roads. Currently, people determined to gain access into the site can do so by foot at any point along the project boundary. The primary points of pedestrian access are through the P&W Railroad and Dryden Oil property to the east, the Babcock Power property to the west and the Regional Environmental Council trail off of McKeon Road. Parking is either obtained at

the small commercial plaza at the corner of Millbury Street and McKeon Road or at the Babcock Power parking area at the northwest.

4.5 Existing Open Space Resources

The entire site is currently a City of Worcester open space resource and will remain so after the park is complete. As was mentioned earlier, part of the property is under the jurisdiction of the Worcester Department of Parks,

Example of open space resources within site

Recreation and Cemeteries, the other portion being under the jurisdiction of the Worcester Conservation Commission. Furthermore, the old mill dam appears to be under the jurisdiction of the Worcester Department of Public Works, as is McKeon Road where bike trail and walkways are being proposed. The site abuts

property owned by the Commonwealth of Massachusetts where the proposed Northern Gateway Visitor Center is proposed to be developed. Finally, the Blackstone Bikeway will tie into the property at Millbury Street and the Visitor Center site.

Once these projects are completed, all of these open space and recreational resources will be integrated to present a unified resource incorporating elements of the Blackstone Gateway Park, Northern Gateway Visitor Center and Blackstone Bikeway.

4.6 Existing Infrastructure

Currently, the site is undeveloped except for the remnants of its former use as a mill pond to provide water power to adjacent industrial buildings. Remnants of this former use include the mill pond dam, raceway and stone retaining wall.

The only utilities that appear on the site include an electrical line that runs along the northern property line from the Babcock Power property to the dam. In addition, there is an easement for a sewer line across the mill pond dam area, with the sewer pipe being tied into the P&W Railroad bridge.

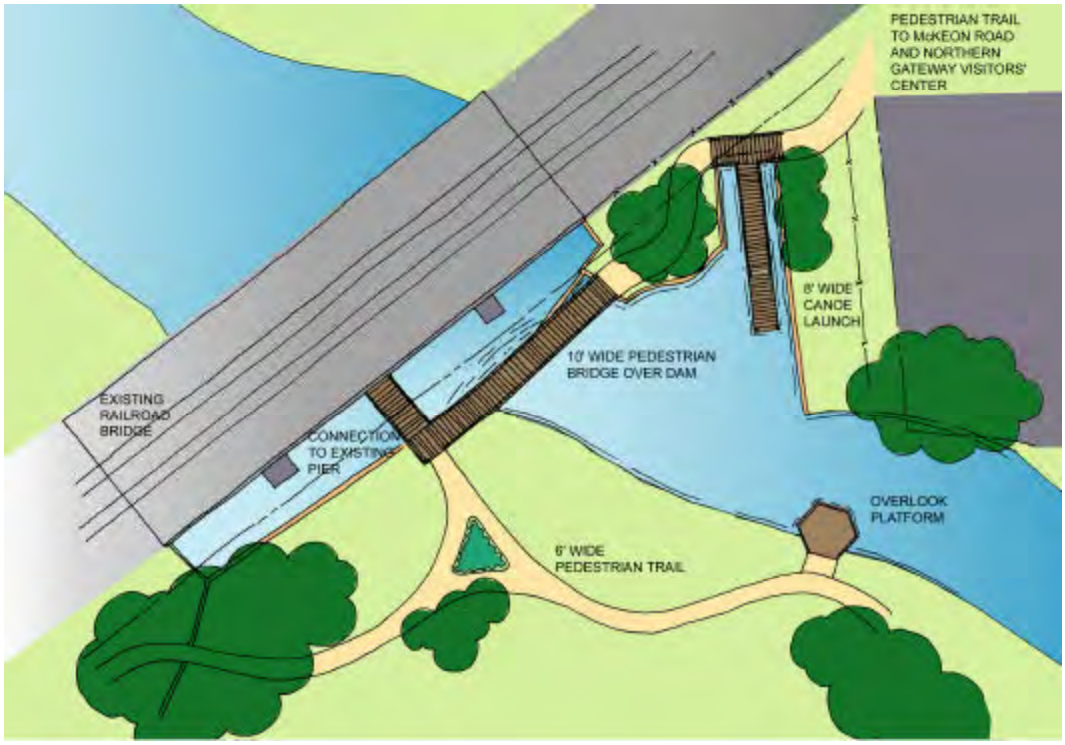
As part of the Route 146 improvement project, an elaborate stormwater detention and ground water recharge area is being planned between the river and the P&W Railroad tracks west of the Dryden Oil property. Although this facility will not be located within the current project property lines, it will have a visual impact on the project area and discharge stormwater into the river just west of the proposed bridge crossing in the middle of the site.

5.0 MASTER PLAN RECOMMENDATIONS

5.1 Design Process

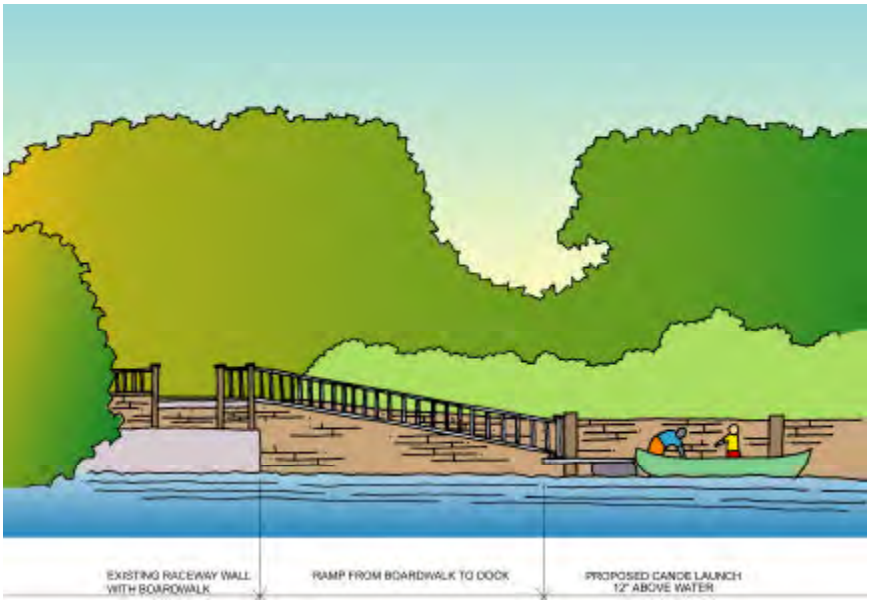
As noted earlier, the design and planning process began several years ago with the deeding of land from the former Riley Stoker Company (now Babcock Power) to the Conservation Commission and the knowledge that the Blackstone River Bikeway would terminate at the proposed Visitor Center. TerraSphere's design process began with committee meetings and site visits and an analysis of existing planning efforts, historic resources and natural resources. From these efforts several analysis drawings were generated to aid in the design development process. The analysis drawings created include an aerial photograph and site context, study area, historic resources, existing topography, slope analysis, circulation, vegetation, and site ecologies diagrams.

Two trail options were then generated from the information revealed by the analysis diagrams. (see Trail Location Alternatives Options 1 and 2). Taking site constraints and possibilities into consideration, the alternatives attempted to address creative solutions for designing accessible walkways while minimizing site disturbance. Slopes along the southwest were too steep for cost-effective, accessible trails. As a result, trails were established at the bottom of the slope with a spur that switches back where the slope is easier to navigate. Throughout the site, earth trails are used as much as possible where soil conditions permit. However, where wetlands dominate the site or where river access is desirable, earth trails transition to boardwalks with river crossings where soils are stable.



Plan detail of pedestrian bridge over dam and canoe launch at main entrance to park

It was determined that the best point to cross into the site from the Visitor Center area is via a bridge anchored over the dam. This access point will serve as the main entrance to the park. A canoe launch area was selected near this entrance along an existing "raceway" wall connected to the dam. For the most part, trail sections in this general area are on land with the beginning of the trail parallel to the existing dam wall.



Canoe launch elevation

Soil sampling was completed by GZA Associates and confirmed the stability of the soils in the locations initially selected for the boardwalks and bridge crossings (see Attachment III).

Trail Option 1 takes a more conservative approach than Option 2. This option shows one primary trail leading through the site with six observation platforms and two river crossings, including the main crossing at the dam. This trail is approximately 2,800 feet in length with an additional 4,900-foot bikeway/trail along McKeon Road. Parking is provided at the Visitor Center.

Trail Option 2 is a bit more aggressive than Option 1, but provides greater flexibility for pedestrians through looping trail systems and an additional bridge crossing. This trail is approximately 5,400 feet in length with an additional 4,900-foot bikeway/trail along McKeon Road. This option also shows two additional parking areas, one on McKeon Road and the second at Babcock Power.

5.2 Final Master Plan

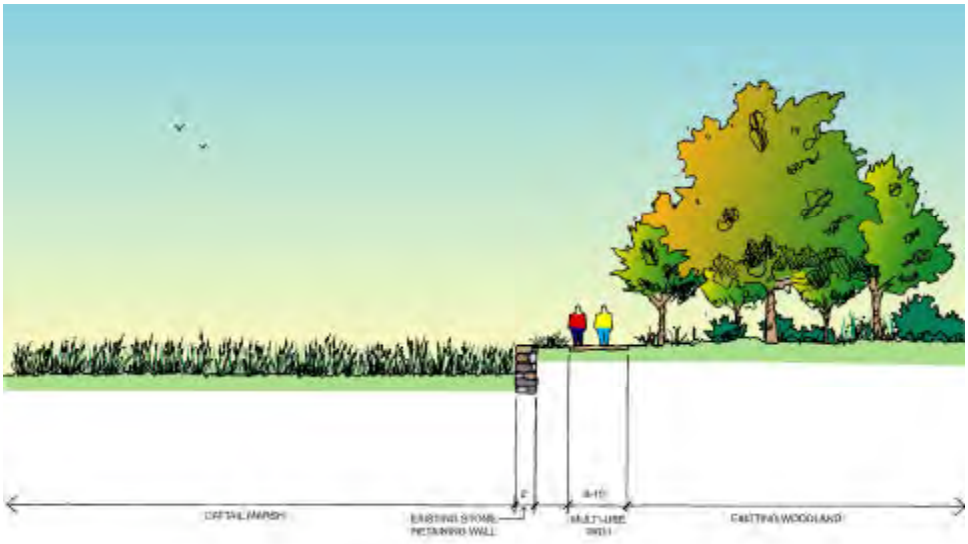
After discussions with the Recreation Sub Committee Trail Option 2 was chosen as the primary plan to modify for the final design. The dam crossing is featured as the entryway into the park. This point of beginning provides several options for observers. Park users can go down the ramp for the canoe launch; view the gracefully arched dam wall from the railroad buttress; take a short trail down to the water's edge, which will provide pleasant vistas up and down the river from two observation platforms; or venture further into the park on the trail that runs parallel with the historic dam wall. Observation platforms with

Option 2 illustrative site plan

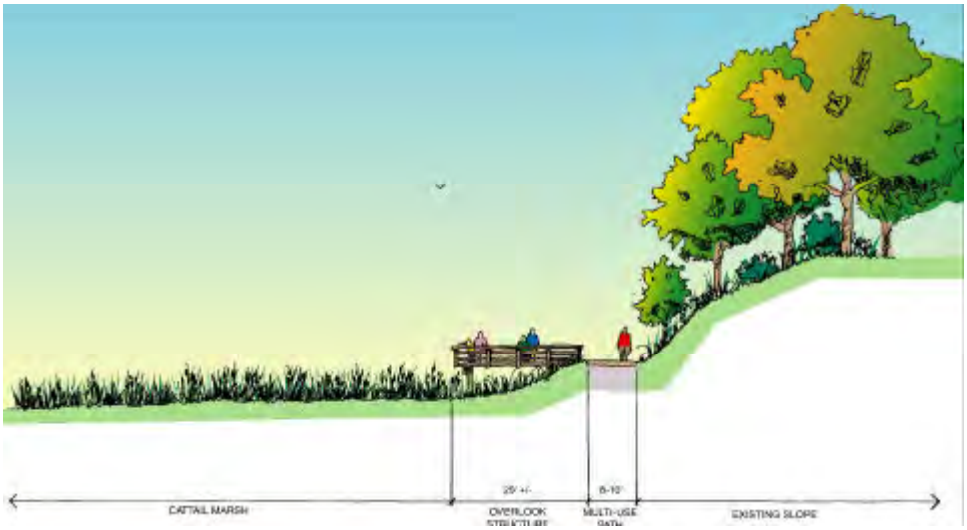
informational/educational signage can be studied from several more observation platforms. When the ground becomes wet, the earth trail transitions to

boardwalks supported by unobtrusive piers. The trail then allows a user to cross the river or venture a bit further up to a second river crossing. On the opposite side of the river, the boardwalk hugs the river's edge and ends at another observation platform. A trail user can also choose an alternate path that follows the bottom of the slope. This trail provides an experience of the park unlike that from the boardwalk or other trails. The trail then heads up the slope to McKeon Road or to the parking lot at Babcock Power.

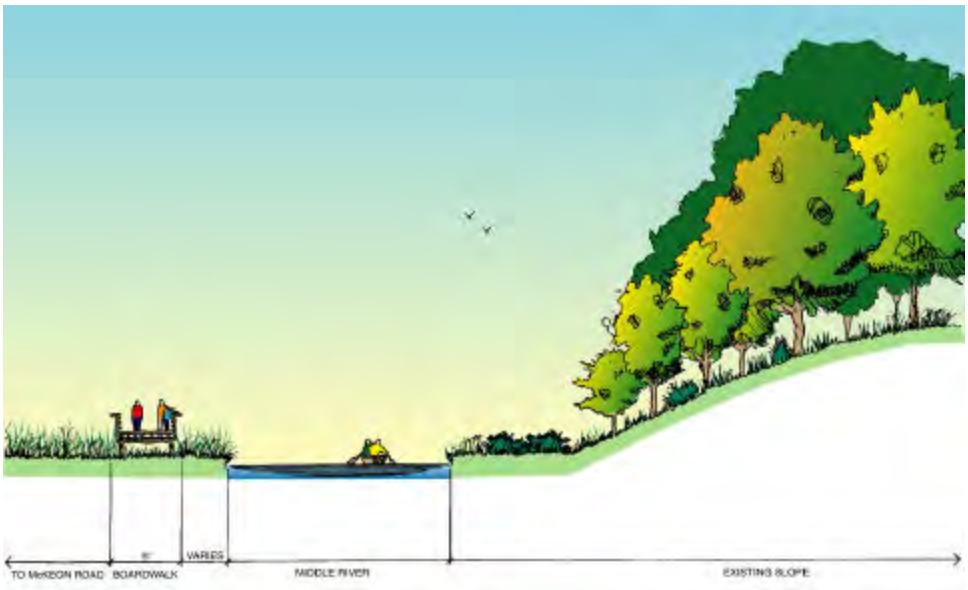
Detail showing trail head and proposed Visitor Center



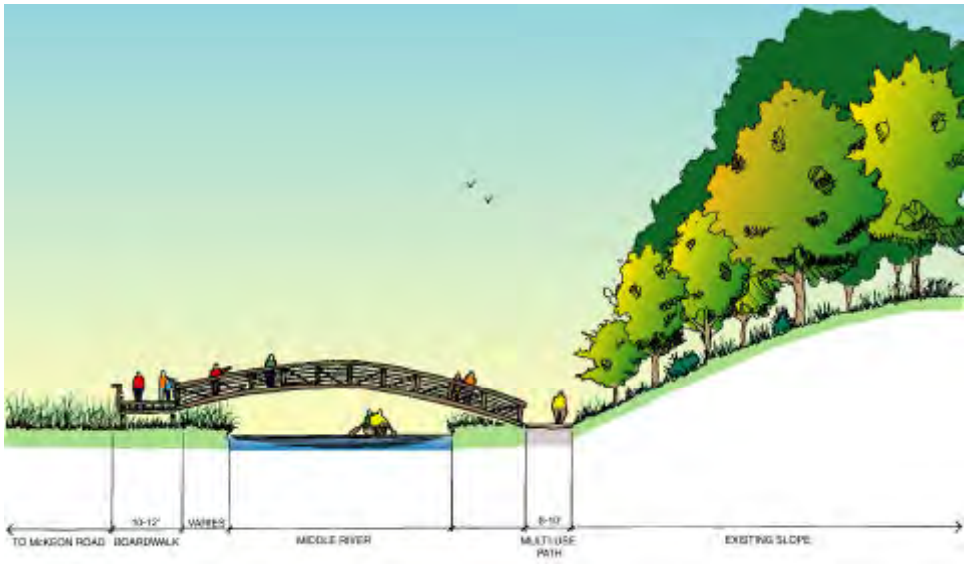
Section elevation showing path along historic dam wall within site



Section elevation showing observation deck and earth trail within site

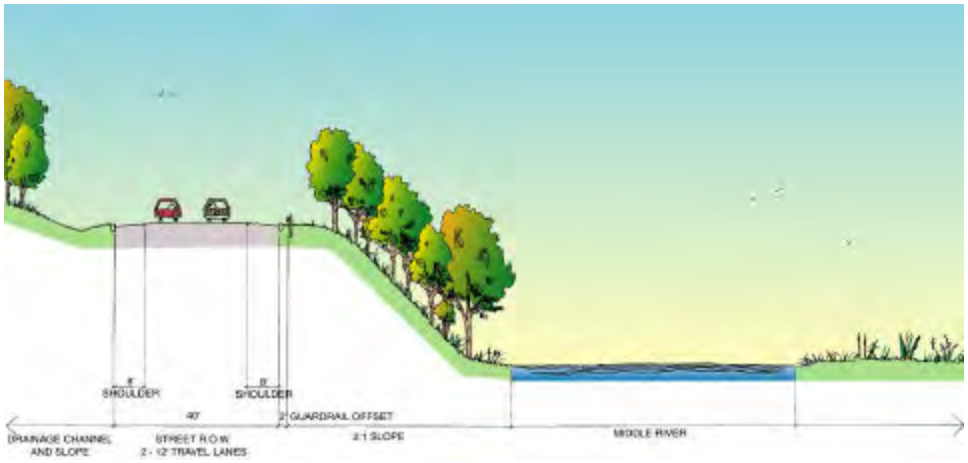


Boardwalk over wetlands within site



Bridge connecting boardwalk to earth path

An entirely different experience awaits bicycle users or pedestrians who use McKeon Road. The proposed design shifts the existing driving lanes to the west and provides a designated bike trail, separated from traffic by a guardrail. A five-foot grass strip separates pedestrians from bicyclists except at the bottom of the hill at the southern end of McKeon Road.

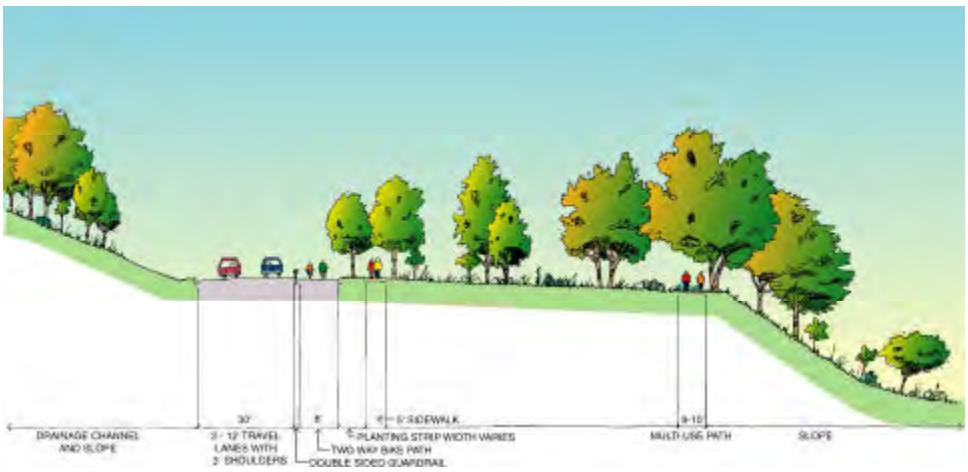


Existing condition along McKeon Road

Proposed bikeway and sidewalk along McKeon Road

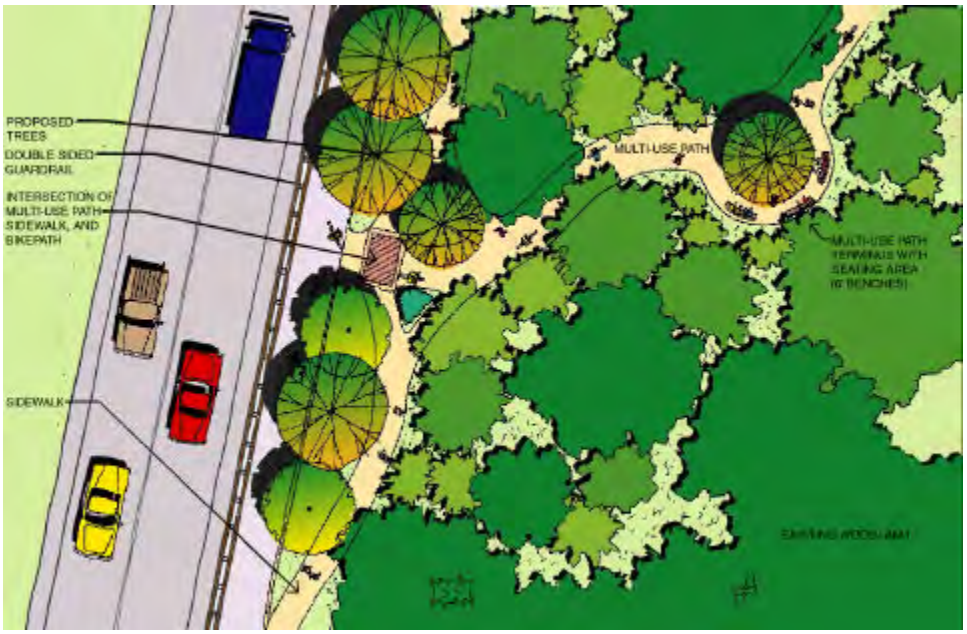
Due to the steep grades, and existing roadway width, there is not enough distance in the existing surface for both a sidewalk and grass strip in this area. At the top of the hill, near the entrance to the College of the Holy Cross, the terrain becomes flat and wide. This allows a combined bicycle and pedestrian trail to be positioned at the top of the slope so people can view the park below. A small parking area accommodates a dozen vehicles and is in close proximity to a pedestrian entrance to the lower paths and boardwalk.

Existing condition along McKeon Road



Proposed bikeway, sidewalk and multi-use path along McKeon Road

The overall trail network provides a variety of experiences for park users. This park will provide endless opportunities for local schools to take advantage of this natural resource. Both passive and active recreation are accommodated in a variety of ways though the various paths, boardwalk, bikeway, canoe launch, and observation platforms. Although bicycles will not be allowed in the lower park, they are accommodated with a safe, new path along the roadway with further bicycle linkages made whenever possible. The opportunity to link this park with the Blackstone River Bikeway is an exceptional opportunity to present Worcester in a positive manner.



Detail enlargement along McKeon Road where bicycle and pedestrian paths join

Physical features included in the Blackstone Gateway Park project:

- 3,575 feet of accessible trails.
- 1,880 feet of boardwalk
- 4,860 feet of pedestrian/bikeway trail
- 2 arched bridges over river
- 1 flat bridge over dam
- 6 observation platforms
- 2 canoe launch areas

- Interpretive and directional signage
- Parking area

Associated Improvements by Others to support the Blackstone Gateway Park

- Northern Gateway Visitors Center
- Visitor Center Parking Lot
- Blackstone River Bikeway
- Route 146 Pedestrian Overpass
- Trail connection to Broad Meadow Brook
- Additional canoe launch

Illustrative rendering of park entrance area

6.0 PROJECT ELEMENTS AND ESTIMATED COSTS

6.1 Project Elements

As the Blackstone Gateway Park Master Plan was finalized, discussion turned to construction techniques and materials that would be used to support the installation of recommended elements within this environmentally and ecologically sensitive area.

Construction techniques were evaluated to determine how the trails, boardwalk and bridges could be installed with minimal impact to the surrounding environment. The biggest area of concern was the foundations/footings for the boardwalk and bridges. Following initial soil sampling and research of products, it was determined that a "helical pier" system would work the best (see Attachment Section IV). This "screw-like" system can be installed deep enough to reach stable soils and can be installed without excavating any soil by the use of a machine that screws the helical pier into the soil to the proper depth.

Other construction materials were selected to be durable, yet integrate with the natural character of the site. HDPE recycled plastic is recommended for the boardwalk and platform decking because it gives the appearance of wood but has a much longer life and does not splinter. Stonedust or stabilized soil paths will provide handicap accessibility while giving a natural appearance.

Having made these critical decisions on materials and construction techniques, the following cost estimate was prepared based on these assumptions.

Materials (see Attachment IV for description of all materials)

- Boardwalks & observation platforms will be constructed with HDPE recycled plastic decking.
- Foundations for boardwalk, observation platforms and bridge will be a helical pier system.
- Bridges will be wood or steel frame and supports, with wood decking and railings. Bridges will be arched to allow canoe access beneath, except at the dam crossing.
- Trails will be constructed of stonedust or stabilized soil.
- Benches can be constructed of materials found on the site (as is done now), or HDPE plastic to match the boardwalk and platforms (should be done if benches are worked into the perimeter of platforms) or wood.
- Kiosks and signage should be constructed with wood supports. Panels should be constructed of a durable material that can resist vandalism, such as aluminum with a protective clear coating.

Assumptions

- Public vehicle and bicycle access will not be allowed. Only maintenance trucks and safety vehicles will be allowed on the paths only.
- Trails, boardwalk & bridges will have a 6' wide walking surface.
- The vegetation along trials will be cleared to 8' wide to allow for access by maintenance & safety vehicles when necessary.
- There will be no lighting within the site.
- Gates will be installed at entrances to allow the trials to be closed to the public if necessary.

6.2 Preliminary Cost Estimate

These cost estimates are based on the use to the material described above. Costs are broken into two sections to better associate costs with improvements. A 25% contingency and OHP (overhead & profit) has been carried as these costs are based on very preliminary plans. As designs are advanced for various improvements, the costs can be better defined and estimated.

Preliminary Cost Estimate – Middle River Area

Quantity	Item	Unit Cost	Total Cost
3,600 l.f.	Stonedust trail, 6' wide	$16 - $20/l.f.	$57,600 - $72,000
1,900 l.f.	HDPE Boardwalk with helical piers, 6' wide	$200 - $300/l.f.	$380,000 - $570,000
3	Bridges	$65,000 - $92,000/ea	$195,000 - $276,000
6	Observation platform – 175 s.f. each	$7,000 - $9,000/ea	$42,000 - $54,000
2	Canoe launch	$5,000 - $10,000/ea	$10,000 - $20,000
Lump Sum	Signage – kiosk	$10,000 - $15,000	$10,000 - $15,000
Lump Sum	Site Amenities (benches, bollards, bike rack trash receptacles, , etc.)	$15,000 - $20,000	$15,000 - $20,000
Lump Sum	Site preparation	$25,000 - $30,000	$25,000 - $30,000
	25% for contingency & Contractors Overhead		$175,000- $242,000
	Total Estimated Construction Cost		**$899,600 - $1,320,000**
	Estimated Survey, Permitting and Site Engineering Cost		**$135,000 – 198,000**
	Grand Total		**$1,034,600 - $1,518,000**

Preliminary Cost Estimate – McKeon Road Area

Quantity	Item	Unit Cost	Total Cost
4,000 l.f.	Asphalt sidewalk, 6' wide	$15 - $18/l.f.	$60,000 - $72,000
900 l.f.	Combined asphalt pedestrian/bike trail, 10' wide	$25 - $30/l.f.	$22,500 - $27,000
4,000 l.f.	Wooden Guardrail	$35 - $40/l.f.	$140,000 - $160,000
Lump Sum	Signage	$8,000 - $12,000	$8,000 - $12,000
Lump Sum	Site Amenities (benches, bollards, trash receptacles, bike rack, etc.)	$15,000 - $20,000	$15,000 - $20,000
Lump Sum	Site preparation	$15,000 - $20,000	$15,000 - $20,000
	Sub-total		$260,500 - $311,000
	25% for contingency & Contractor's Overhead		$65,125 - $77,750
	Total Estimated Construction Cost		**$325,500 - $388,000**
	Estimated Survey, Permitting and Site Engineering Cost		**$48,825 - $58,200**
	Grand Total		**$374,325 - $446,200**

7.0 NEXT STEPS

Ultimately the success of this master plan will be the result of successful fundraising and construction of the various project elements. However, implementation will most likely occur over a number of years, and funding will most likely come from a number of sources.

Therefore, this section describes the steps that will be necessary to begin implementing this master plan. A phasing plan is described. However, this phasing plan can be altered if funding becomes available for specific project elements.

In addition, this section lists potential funding sources that are appropriate for this project. With a total cost estimate of over one million dollars, funding will most likely come from a number of sources. The Greater Worcester Land Trust has great success in identifying and obtaining funding for numerous open spaces improvements initiated in and around Worcester. Many of these projects have been done in conjunction with the City of Worcester and the Blackstone River Valley National Heritage Corridor. Based on this success, the Greater Worcester Land Trust should continue to take the lead in raising funds for this project.

7.1 Phased Development Approach

<u>On-going Actions</u>

The Greater Worcester Land Trust and the city of Worcester should continue with the following actions that have already been initiated.

- Continue to look for sources of funds to construct project elements.
- Works with Dryden Oil to obtain an easement to allow trail across their property by from the mill pond dam along the stone wall area.
- Work with Babcock Power to obtain permission to use their parking lot, with certain limitations, and to construct a trail from their lot into the site.

- Finalize the grant application and the grant agreement with the Massachusetts Division of Resource Conservation for construction of a canoe access ramp and dock at its proposed location by the Mill Pond dam.
- Conduct a property line survey and determine ownership of various municipal and abutting parcels in order to establish easements through abutter's property and determine ownership of the mill pond dam and related structures.
- Continue coordination with MHD to assure that public access to the site will be accomodated as part of the McKeon Road/Millbury Street intersection improvements and Blackstone River Bikeway construction.
- Continue coordination with the City of Worcester and BVNHC Commission to integrate the design and construction of the visitor's center with the Blackstone Gateway Park.
- Continue dialogue with the Worcester D.P.W. to enhance the bike trail along McKeon Road and add pedestrian walks and trails in this area.

As was stated earlier, one purpose of this master plan is that it allows the Greater Worcester Land Trust and the City of Worcester flexibility in developing smaller components of the trail and boardwalk system as funding becomes available, knowing that all elements will ultimately be linked into a unified network. With that being said, the following phases present a recommended development sequence.

Phase One

- Construct the main entrance into the site by means of a trail connection from the new Millbury Street/McKeon Road intersection through the old Millbury Street R.O.W. and to the new main entry into the site at the Mill Pond dam. (260l.f.: $4,160 - $5,200)
- Install one canoe access facility at the Mill Pond dam. ($5,000 - $10,000)
- Construct the first bridge connection, which is to be located across Mill Pond dam into the site. (This will require a structural analysis of the dam structure). ($45,000 - $62,000)
- Upgrade existing earth trails through the Dryden Oil property into the site to a point where the earth trail would need to become a boardwalk due to wetlands. (1000 l.f.: $16,000 - $20,000)
- Install an observation platform at this terminus. (will require an easement from Dryden Oil) ($7,000 - $9,000)

Estimated Phase One Total Cost (including 25% OHP and 10% Survey and Site Engineering) : $104,166 - $143,370

Phase Two

- Install an initial section of the boardwalk to provide a connection from the Phase One trail to the closest bridge, herein referred to as the second bridge connection. (250 l.f.: $50,000 - $75,000)
- Install second bridge connection over the river. This will require additional soil sampling in order to design the bridge footings. Soil samples should be taken with a bobcat mounted drill rig during times when the ground is relatively dry and partly frozen to minimize impacts to soils. Conservation Commission approval will be required before this work is done. ($57,500 - $77,000)
- Install a stonedust path from this second bridge along the base of the slope to its connection to McKeon Road at Holy Cross College. This will require a relatively short boardwalk section to connect this path to the bridge. (trail 1300 l.f.: $20,800 – $26,000, boardwalk 175 l.f. $35,000 – $52,500)

Estimated Phase Two Total Cost (including 25% OHP and 10% Survey and Site Engineering) : $220,455 - $311,175

Phase Three

- Install pedestrian pathway and improved bikeway along McKeon Road, assuming a design approach has been accepted by Worcester D.P.W. This pedestrian connection will provide a second means of connecting the McKeon Road/Holy Cross trail access point back to the beginning of the trail at the Mill Pond dam. It will also provide pedestrians the opportunity to view the site from the top of the slope along McKeon road. (trail 3000 l.f.: $45,000 - $54,000, bikeway 900 l.f.: $22,500 - $27,000, guardrail 3000 l.f.: $140,000 - $160,000)
- Attempt to secure an agreement with Babcock Power to use their parking lot for access to the trail system. If this can not be secured, then the proposed small parking area off of McKeon Road should be installed, unless in this phase, and added to this cost.

Estimated Phase Three Total Cost (including 25% OHP and 10% Survey and Site Engineering) : $280,125 - $325,350

Phase Four

- Construct the extensive boardwalk trail along the River from the bridge north towards the Babcock Power property, eventually transitioning into a stonedust trail that connects to the McKeon Road/Holy Cross access point. (900 l.f.: $180,000 - $270,000)
- This stonedust trail should also connect to the Babcock Power parking lot, provided they have given approval for an easement and use of their lot. (1250 l.f.: $20,000 - $25,000)

Estimated Phase Four Total Cost (including 25% OHP and 10% Survey and Site Engineering) : $270,000 - $398,250

Phase Five

- Install the third bridge crossing and boardwalk \sections connecting that bridge to the boardwalk segments already in place. (bridge $57,500 - $77,000, boardwalk 625 l.f.: $125,000 - $187,500)

Estimated Phase Five Total Cost (including 25% OHP and 10% Survey and Site Engineering) : $246,375 - $357,075

Additional Elements

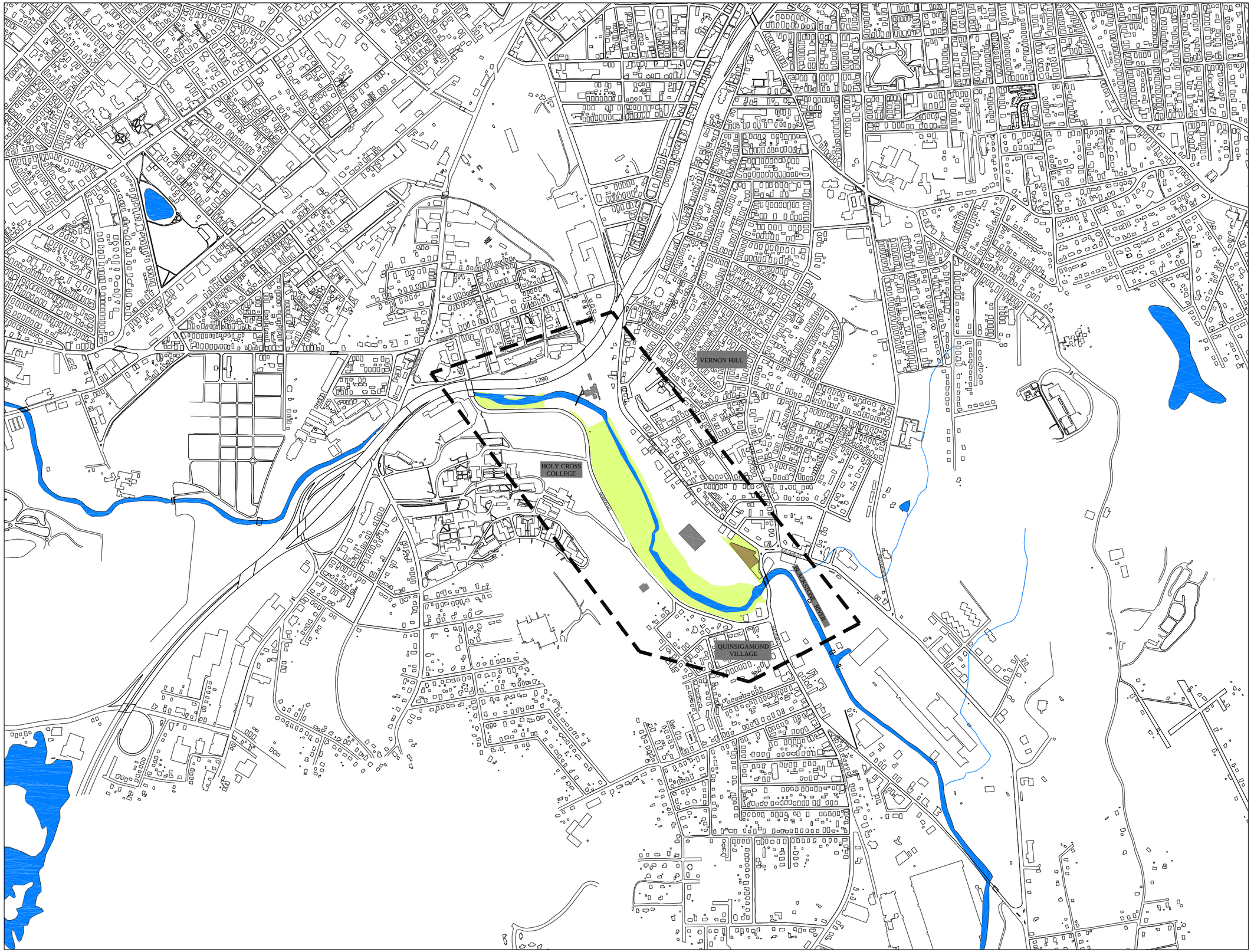
- To the extent possible, install signage, benches and interpretive panels as part of each phase of the construction. However, these are relatively low costs items that can be added later as funds are solicited from private donors who may wish to sponsor such items.
- To the extent possible, install observation decks as part of each trail and boardwalk construction phase. However, these decks are expensive and can be added later. Corporate sponsors may be solicited for the observation decks with a plaque recognizing their contribution and identifying it as the "Smith Company Observation Platform". Therefore, as school groups use the site for educational purposes they can be told to meet at the "Smith Company Platform".

7.2 Funding

The following list of funding sources was prepared by TerraSphere based on initial research and experience on other projects.

- Bond referendums
- Local Capital Improvement Plans
- Adopt-A-Trail Programs
- State Department of Transportation

- Community Development Block Grants
- State Water Management Funds
- The Urban Park and Recreation Recovery Program (UPARR)
- Greenways & Trails Demonstration Grants Program
- Community Preservation Act
- Urban Self-Help Program
- Land and Water Conservation Fund
- New England Grassroots Environment Fund
- Partnerships
- Volunteers



BLACKSTONE GATEWAY PARK

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:

TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

Scale: 1" = 1000'

Date: DECEMBER 12, 2002

Sheet Title:

SITE CONTEXT

BLACKSTONE GATEWAY PARK

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:
TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

Scale: 1" = 400'

Date: DECEMBER 12, 2002

Sheet Title:

STUDY AREA

BLACKSTONE GATEWAY PARK

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:
TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

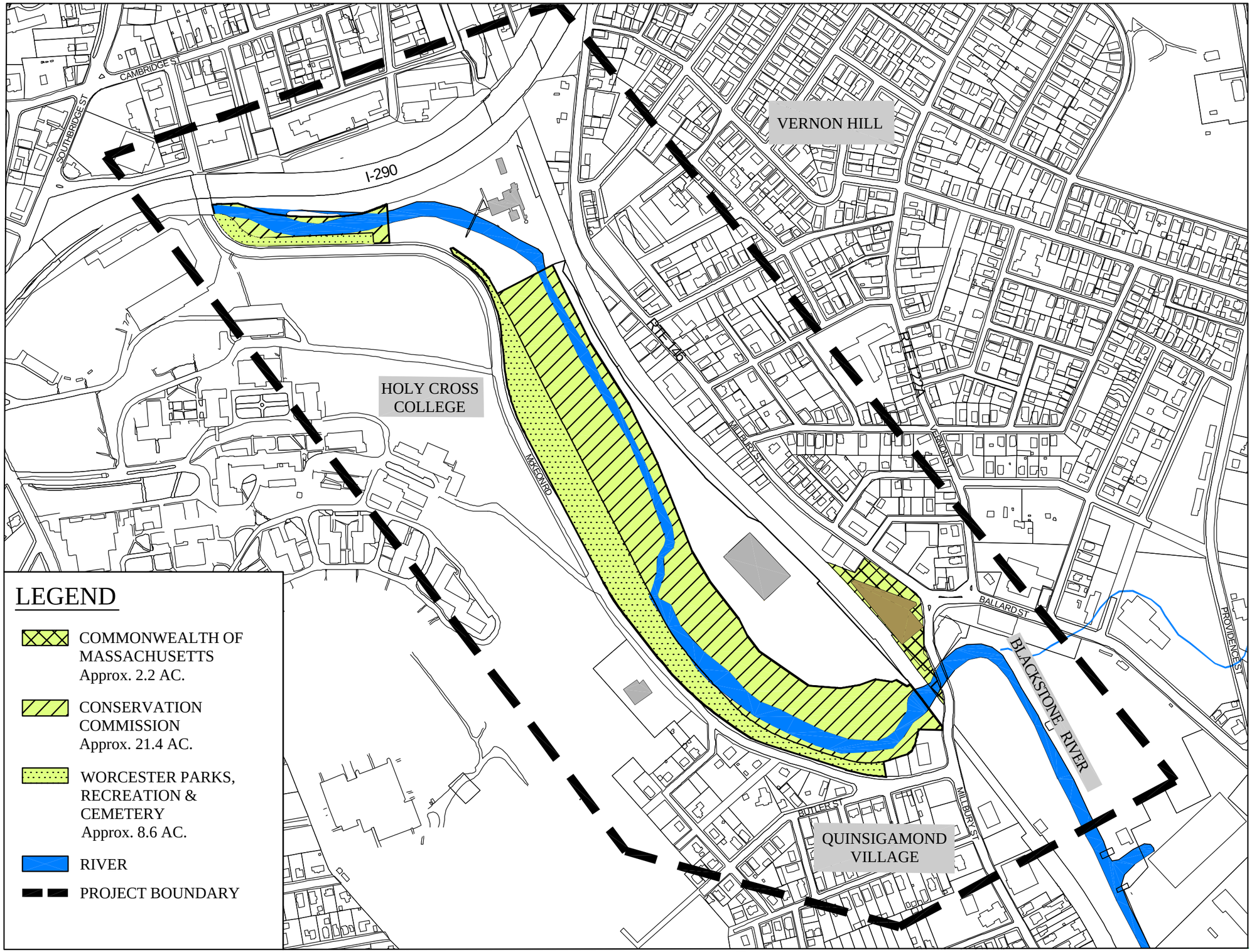
North

Scale: 1" = 400'

Date: DECEMBER 12, 2002

Sheet Title:

STUDY AREA



LEGEND

- COMMONWEALTH OF MASSACHUSETTS Approx. 2.2 AC.
- CONSERVATION COMMISSION Approx. 21.4 AC.
- WORCESTER PARKS, RECREATION & CEMETERY Approx. 8.6 AC.
- RIVER
- PROJECT BOUNDARY

BLACKSTONE GATEWAY PARK

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:
TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

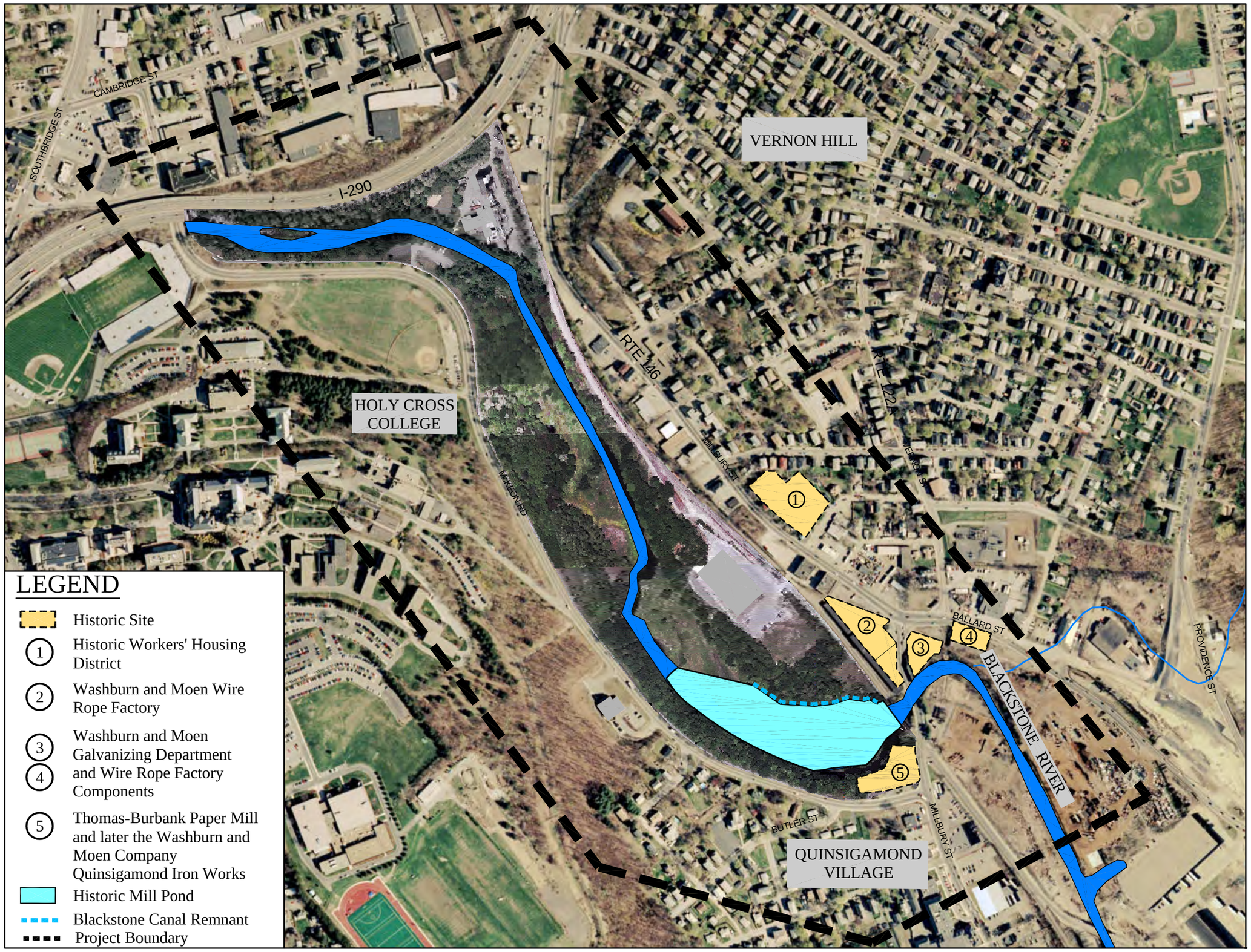
Scale: 1" = 400'

Date: DECEMBER 12, 2002

Sheet Title:

PARCEL OWNERSHIP DIAGRAM

BLACKSTONE GATEWAY PARK



LEGEND

- Historic Site
- (1) Historic Workers' Housing District
- (2) Washburn and Moen Wire Rope Factory
- (3) (4) Washburn and Moen Galvanizing Department and Wire Rope Factory Components
- (5) Thomas-Burbank Paper Mill and later the Washburn and Moen Company Quinsigamond Iron Works
- Historic Mill Pond
- Blackstone Canal Remnant
- Project Boundary

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:

TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

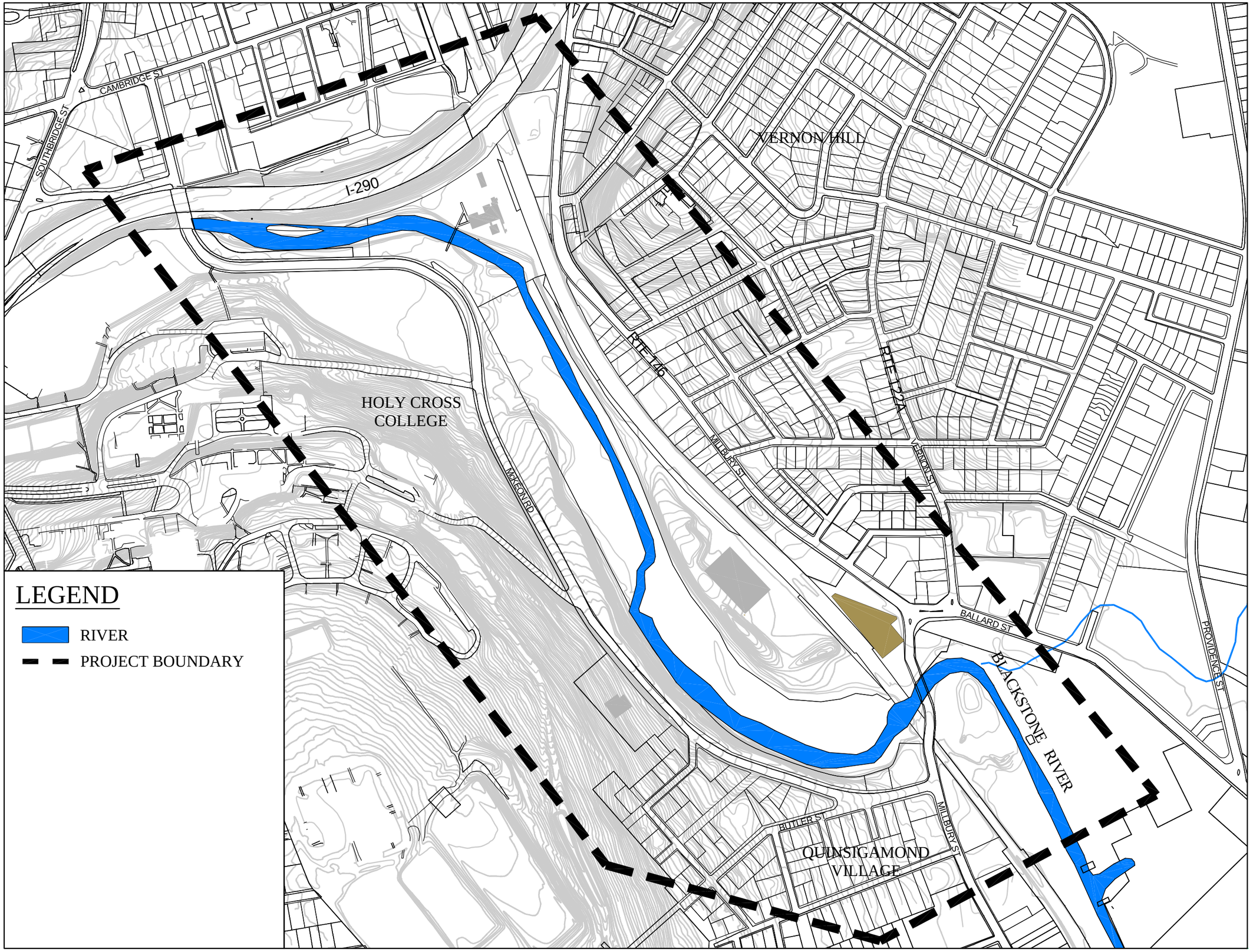
Scale: 1"=400'-0"

Date: DECEMBER 12, 2002

Sheet Title:

HISTORIC FEATURES

BLACKSTONE GATEWAY PARK



LEGEND

- RIVER
- PROJECT BOUNDARY

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:
TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

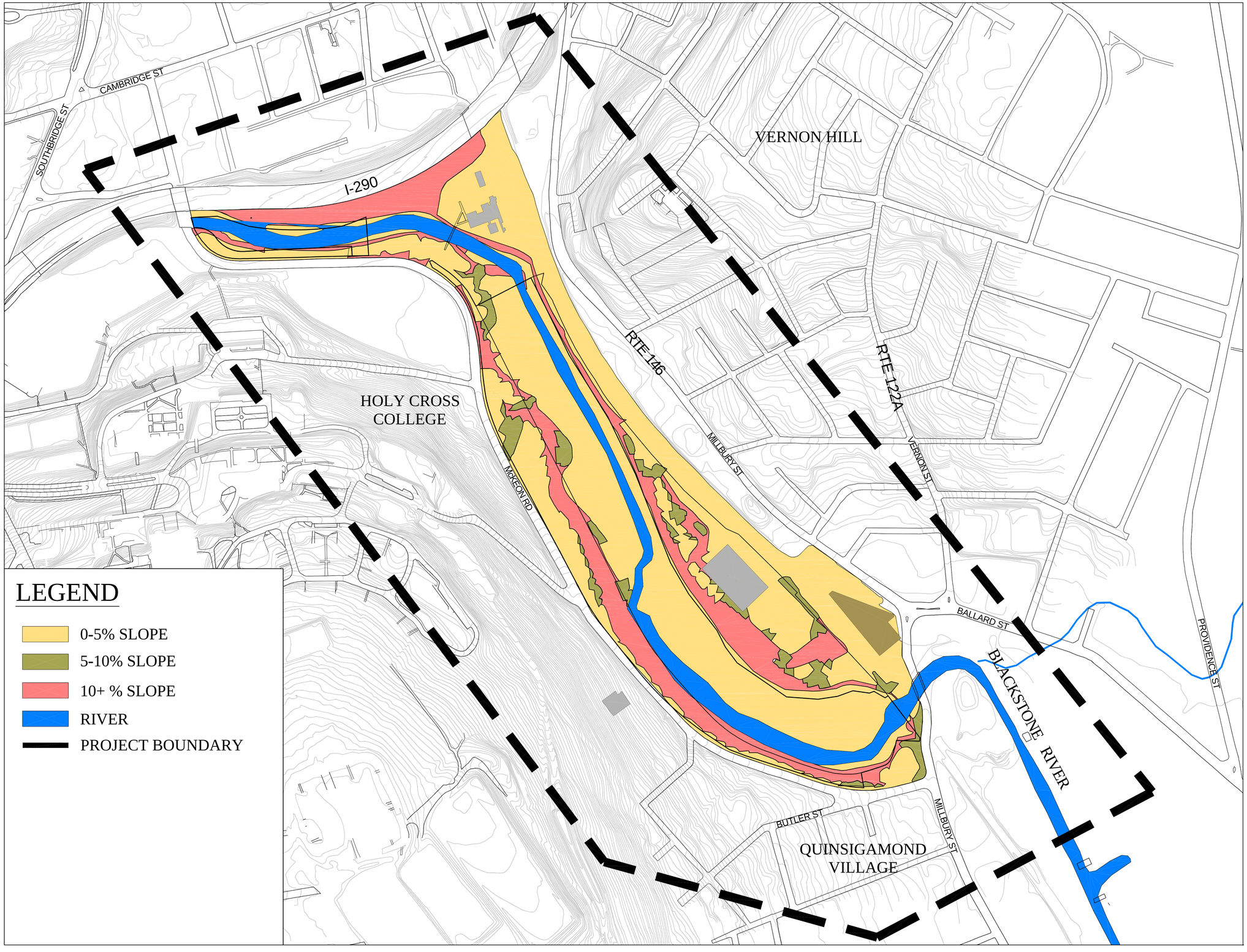
Scale: 1" = 400'

Date: DECEMBER 12, 2002

Sheet Title:

EXISTING TOPOGRAPHY

BLACKSTONE GATEWAY PARK



LEGEND

- 0-5% SLOPE
- 5-10% SLOPE
- 10+ % SLOPE
- RIVER
- PROJECT BOUNDARY

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:

TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

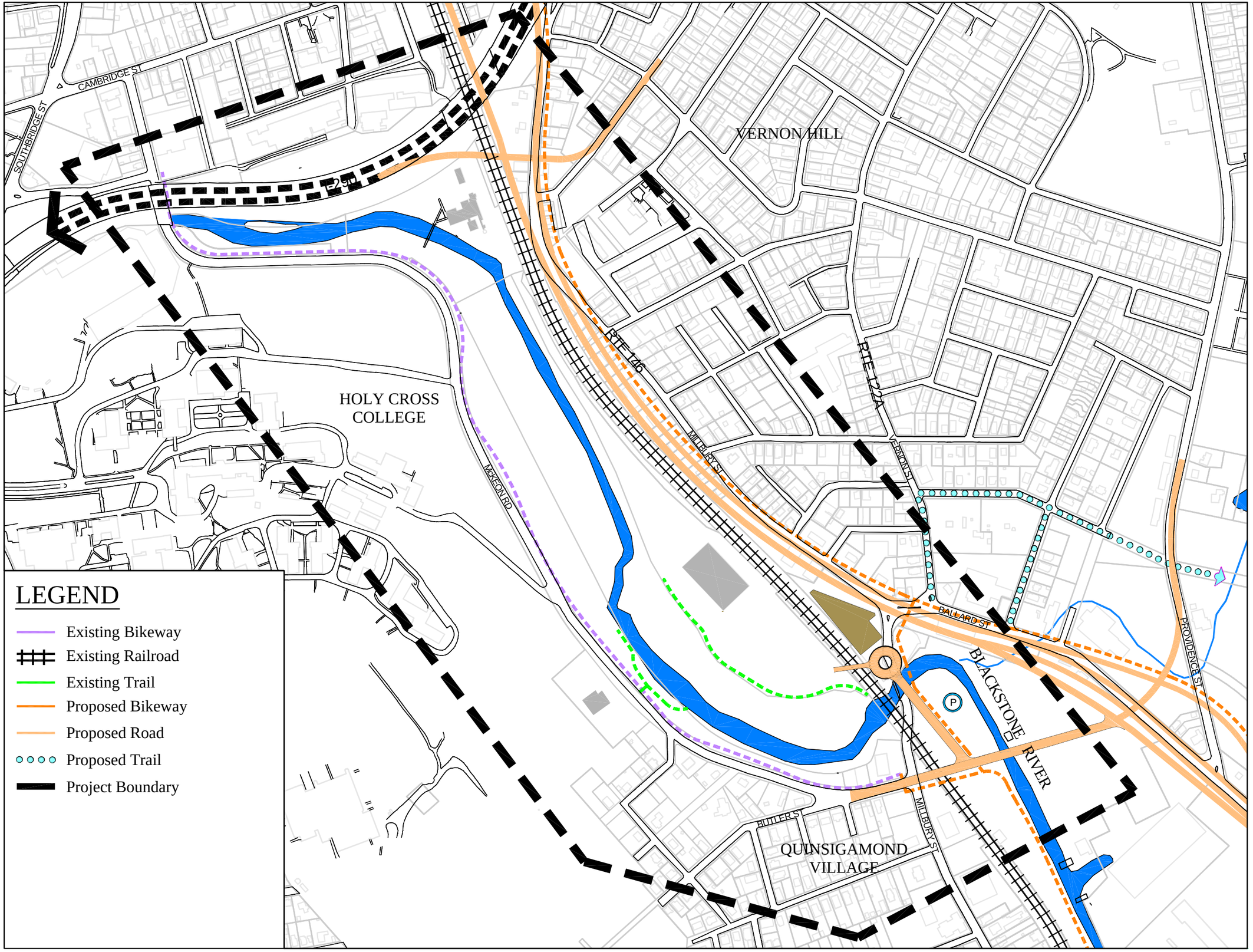
Scale: 1" = 400'

Date: DECEMBER 12, 2002

Sheet Title:

SLOPE ANALYSIS

BLACKSTONE GATEWAY PARK



LEGEND

- Existing Bikeway
- Existing Railroad
- Existing Trail
- Proposed Bikeway
- Proposed Road
- Proposed Trail
- Project Boundary

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:
TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

Scale: 1" = 400'

Date: DECEMBER 12, 2002

Sheet Title:

CIRCULATION DIAGRAM

BLACKSTONE GATEWAY PARK

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:
TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

Scale: 1" = 400'

Date: DECEMBER 12, 2002

Sheet Title:

VEGETATION

BLACKSTONE GATEWAY PARK

LEGEND

- Forested Riparian Streambelt
- Floodplain Forest
- Open Marsh
- Upland Forest
- Project Boundary

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:
TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

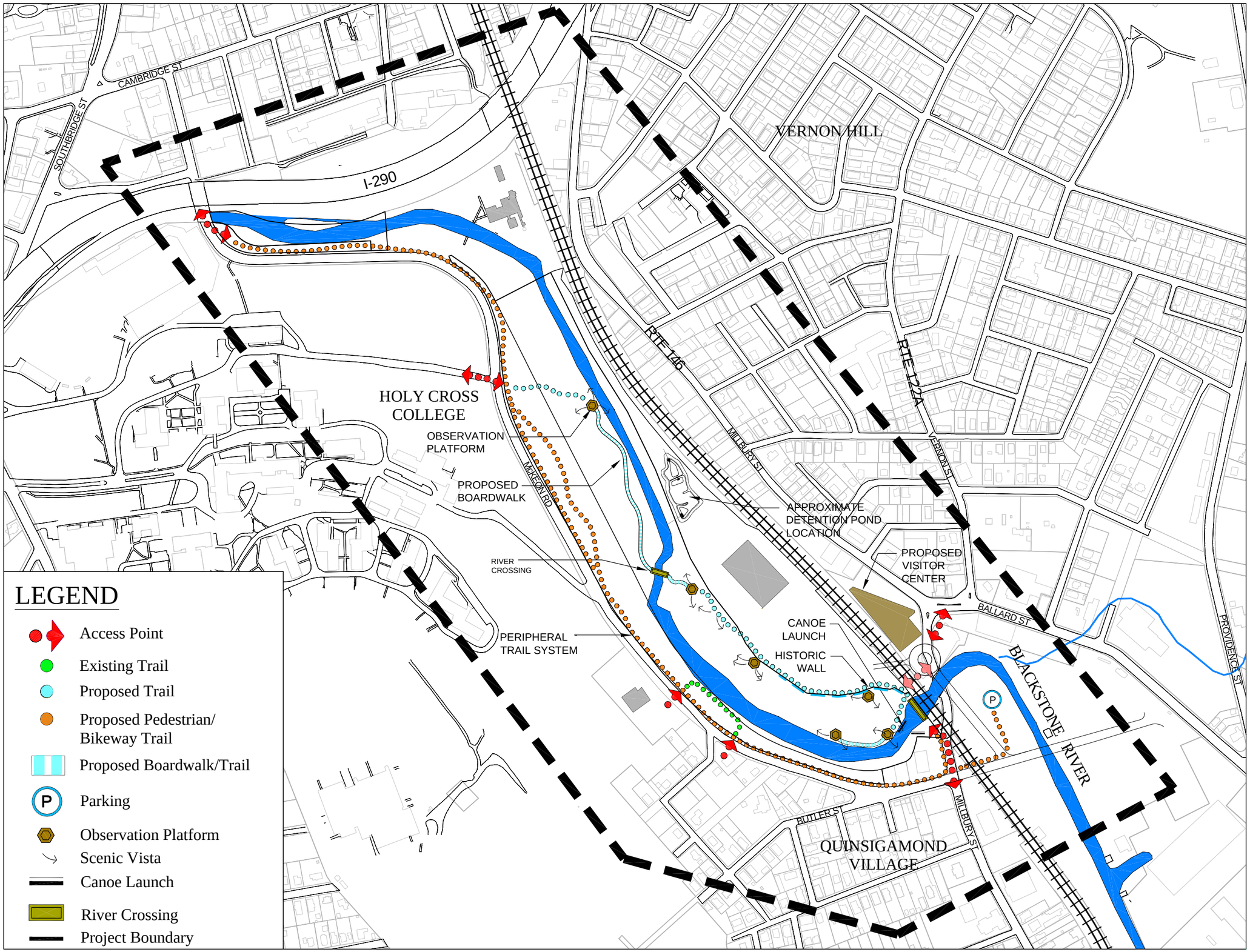
Scale: 1"=400'-0"

Date: DECEMBER 12, 2002

Sheet Title:

SITE ECOLOGIES

BLACKSTONE GATEWAY PARK



LEGEND

- Access Point
- Existing Trail
- Proposed Trail
- Proposed Pedestrian/ Bikeway Trail
- Proposed Boardwalk/Trail
- Parking
- Observation Platform
- Scenic Vista
- Canoe Launch
- River Crossing
- Project Boundary

PREPARED FOR:

Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:

TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

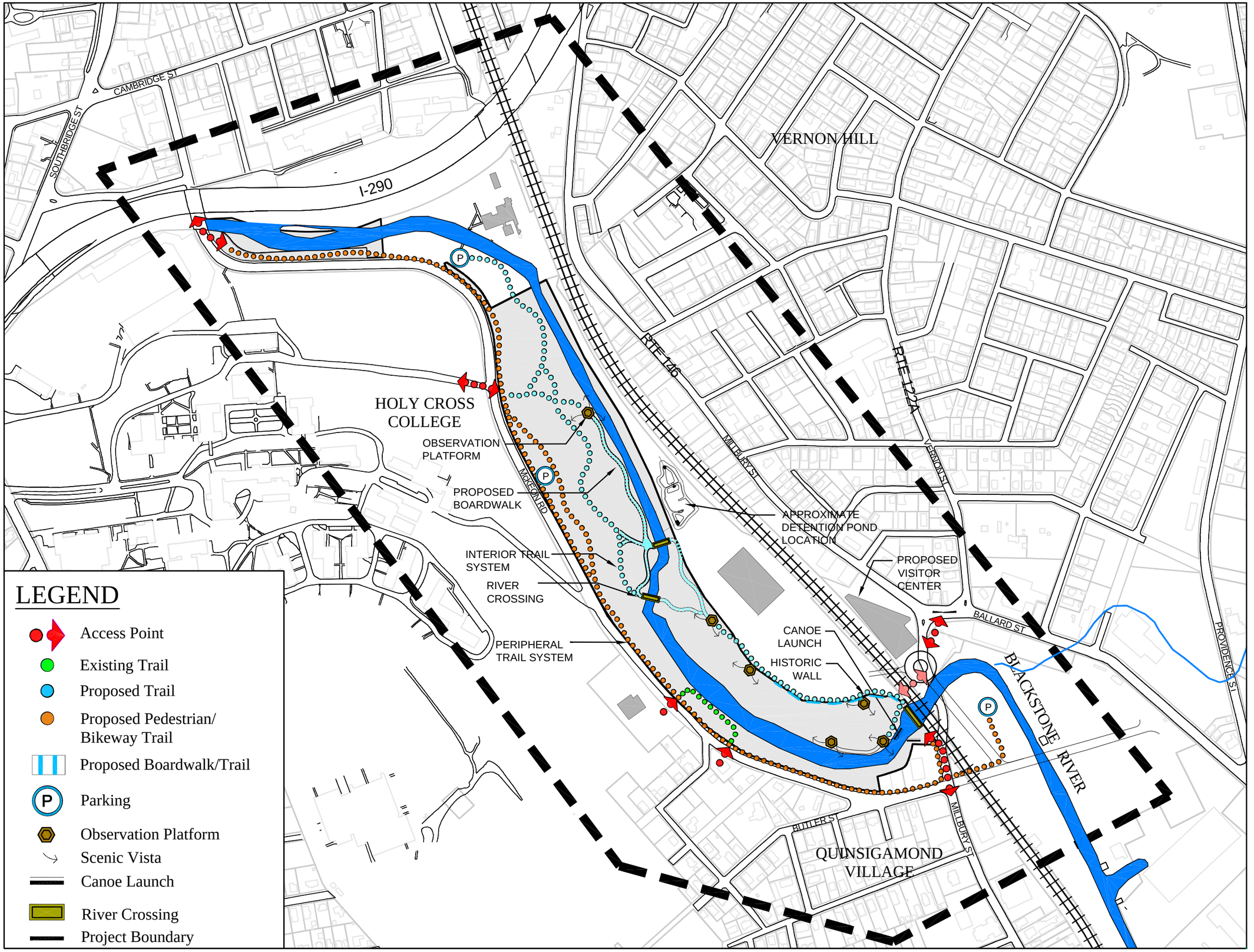
Scale: 1"=200'-0"

Date: DECEMBER 12, 2002

Sheet Title:

TRAIL LOCATION ALTERNATIVES OPTION 1

BLACKSTONE GATEWAY PARK



PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:

TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

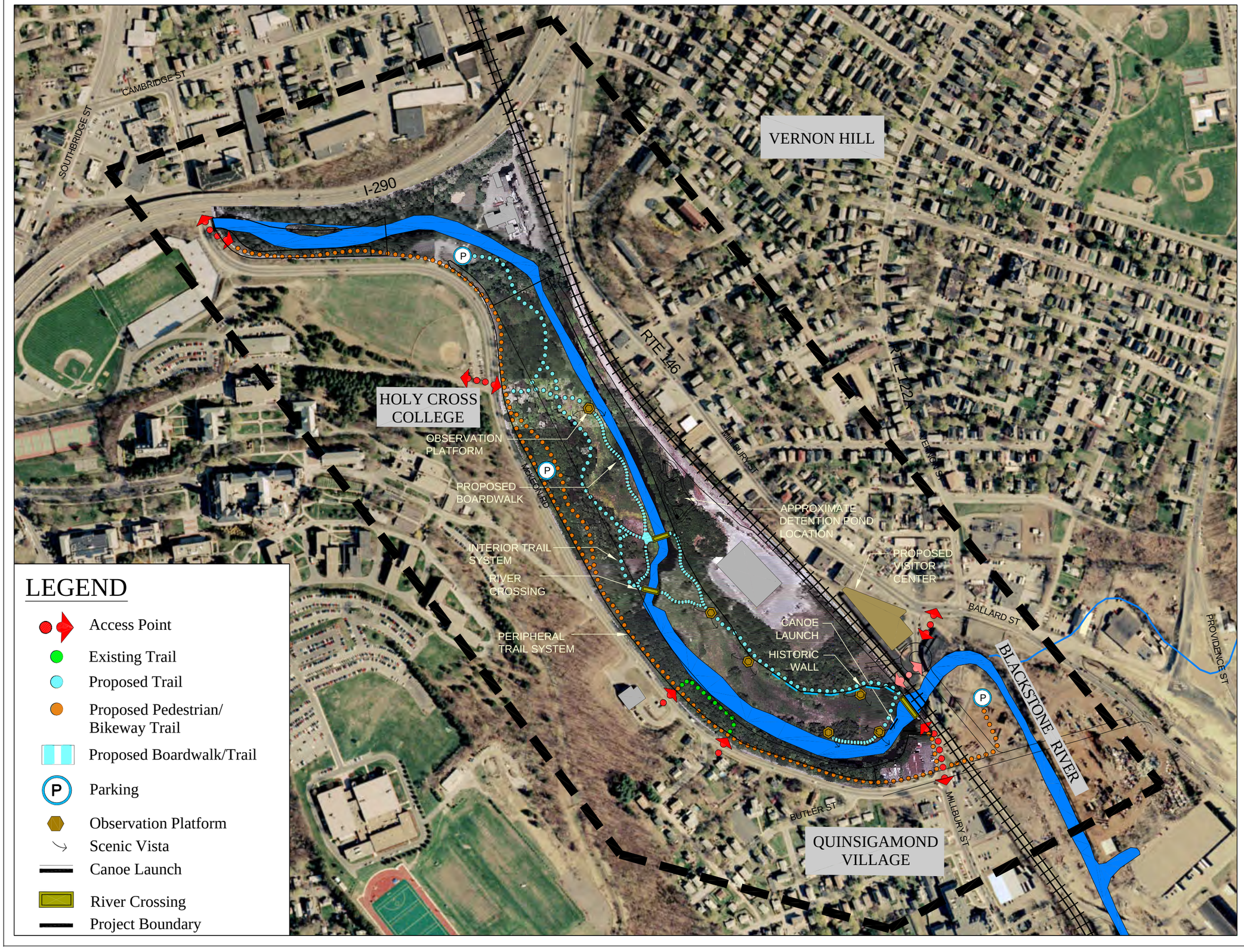
Scale: 1" = 400'-0"

Date: DECEMBER 12, 2002

Sheet Title:

TRAIL LOCATION ALTERNATIVES OPTION 2

BLACKSTONE GATEWAY PARK



LEGEND

- Access Point
- Existing Trail
- Proposed Trail
- Proposed Pedestrian/ Bikeway Trail
- Proposed Boardwalk/Trail
- Parking
- Observation Platform
- Scenic Vista
- Canoe Launch
- River Crossing
- Project Boundary

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:
TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

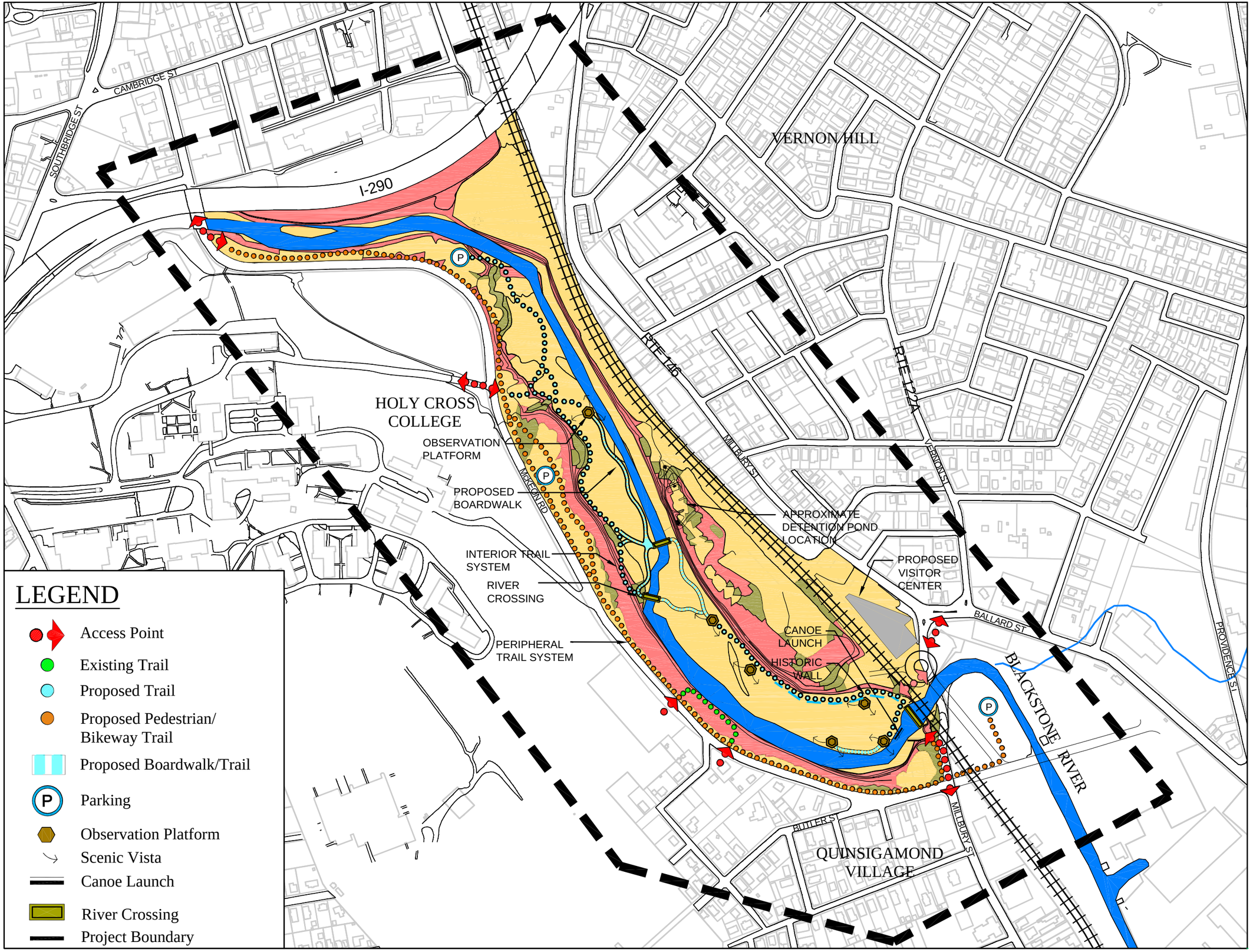
Scale: 1" = 200'-0"

Date: DECEMBER 12, 2002

Sheet Title:

TRAIL LOCATION ALTERNATIVES OPTION 2 - OVER AERIAL PHOTOGRAPH

BLACKSTONE GATEWAY PARK



PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:

TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

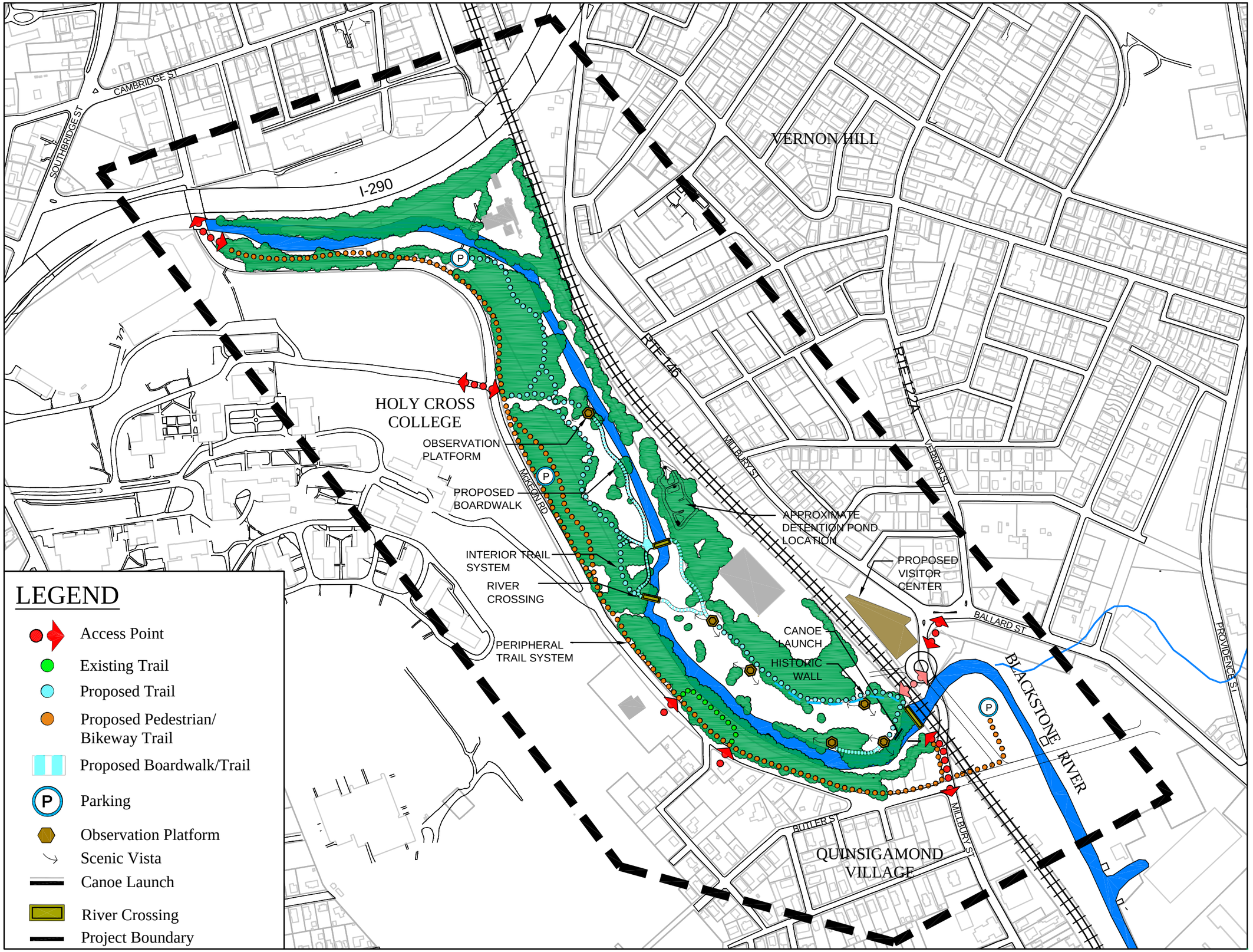
Scale: 1" = 400'-0"

Date: DECEMBER 12, 2002

Sheet Title:

TRAIL LOCATION ALTERNATIVES OPTION 2 - WITH SLOPE ANALYSIS

BLACKSTONE GATEWAY PARK



PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:

TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

North

Scale: 1" = 400'-0"

Date: DECEMBER 12, 2002

Sheet Title:

TRAIL LOCATION ALTERNATIVES OPTION 2 - WITH VEGETATION

BLACKSTONE GATEWAY PARK

PREPARED FOR:
Greater Worcester Land Trust
172 Shrewsbury Street
Worcester, MA 01604

PREPARED BY:
TERRASPHERE
33 Waldo Street - Worcester, MA 01608
15 Elkins Street - Boston, MA 02127

Scale: 1" = 400'-0"

Date: DECEMBER 5, 2003

Sheet Title:

ILLUSTRATIVE MASTER PLAN