Part III: Restored Niagara Gorge Rim: Concept and Benefits

The removal of the RMP would present opportunities for a more appropriate use of the land along the gorge rim. The option of keeping this area in the public domain, restoring its natural ecology and developing recreational trails and scenic overlooks is worthy of consideration from a natural, cultural and economic perspective. The primary goal for removing the RMP is to replace its "hardscape" with "greenscape", utilizing native vegetation to support a publicly-accessible naturalized corridor (including the adjacent gorge). This can be achieved in a way that brings added economic, cultural and environmental value to the greater Niagara community. Arguably, the added value from this new use should prove to be significant enough to offset the costs associated with restoration and management of a naturalized gorge rim.

A. Design Intent and Restoration Goals

The Niagara gorge rim Restoration Concept was developed to illustrate the alternative of ecological restoration and pedestrian use of the rim (see Figure 3.0: Restoration Concept). As illustrated by the Restoration Concept, this would involve restoration or establishment of plant communities that have been degraded or destroyed over time. The specific goals for the Restoration Concept include the following:

1. Remove man-made features that are under-used and/or interfering with natural ecological processes.
2. Restore natural topography and soil profiles to re-establish more natural surface water drainage and infiltration patterns.
3. Eliminate and/or control non-native invasive plant species that currently exist along the gorge rim.
4. Restore or re-create an appropriate suite of native ecological communities, including mixed deciduous forest, successional and wetland communities.
5. Establish and manage the restored ecological communities in a manner that promotes their use by native wildlife species including species that may be listed as endangered, threatened, or of special concern and that ensures ecosystem diversity, integrity, and long-term sustainability.
6. Enhance regional tourism opportunities and their associated economic benefits by improving the scenic and recreational opportunities provided by the Niagara gorge and rim.
7. Increase accessibility to the existing and enhanced trail system, reconnecting the community of Niagara Falls to the Niagara gorge, the defining natural feature of the region.
8. Contribute to the revitalization of surrounding communities through economic development, increased property values, unique ecotourism opportunities, and improved environmental quality.
9. Provide opportunities for public information and education regarding the natural and cultural history of the Niagara gorge and gorge rim, and the ecological restoration program being proposed.
10. Preserve the natural and cultural artifacts that support and enhance the story of the gorge rim's rebirth and renewal.

B. Ecological Improvements

Although the existing gorge rim contains isolated elements of native ecosystems, some unique botanical species, and a degree of indigenous wildlife, from an ecological perspective, it is highly degraded. The overarching intent of the Restoration Concept is to fully re-establish native plant species that will contribute

to a more natural forest-meadows community mix, complete with a diverse overstory, understory, and ground plain vegetation. Whereas the existing corridor is characterized by abundant non-native species, the Restoration Concept proposes the removal of invasives and the planting of native tree saplings, shrubs, and herbaceous species. Within this restored ecological setting, the native botanical species and indigenous wildlife that currently exist within the gorge and rim will be given an opportunity to thrive and multiply.

The native ecological communities along the Niagara gorge rim would ideally have the following species composition and characteristics, as described by Edinger et al. (2002). However, given the degree to which these communities have been altered or eliminated, the extent of soil disturbance, and the abundance of non-native invasive species, it is realistic to assume these restored ecosystems will only resemble the native communities described by Edinger et al. (2002). Although the forest restoration will be accomplished primarily through control of invasives and guided succession, all bare grounded areas will require revegetation. Sodded portions will be minimal. Native seedings will be the first step to new old field/ meadow, shrub transitions, and added forests.

Rich Mesophytic Forest- Very little mature forestland is present within the Study Area. However, the species present in forested communities within Artpark and DeVeaux Woods State Parks most closely represent a rich mesophytic forest, as defined by Edinger et al. (2002) and, therefore, a mixed deciduous forest with a species composition similar to this type of forest community is proposed to be restored. Canopy co-dominants should include five or more of the following species: red oak, red maple, white ash, American beech, sugar maple, black cherry, cucumber tree, and black birch. Other overstory species could include tulip tree, white oak, white pine, basswood, bitternut hickory, black oak, Eastern hop hornbeam, and striped maple. The shrub layer may consist of musclewood, arrow-wood, witch hazel, pinkster, red-berried elderberry, American fly-honeysuckle, roundleaved dogwood, alternate-leaved dogwood, smooth service-berry, and blueberry. The herbaceous layer includes species such as interrupted fern, yellow mandarin, white baneberry, jack-in-the pulpit, early meadow rue, princess pine, partridge berry, roundleaf violet, black cohosh, stoneroot, black snakeroot, large-leaf aster, blue-stem goldenrod, and tall rattlesnake root. Given the disturbed nature of the site, it may be challenging to restore the full diversity of this community. Priority should be given to species present within the existing mature forested areas within the Study Area. Within the canopy, these species include white oak, red oak, sugar maple, beech, black cherry, basswood, black walnut, and shagbark hickory. The understory includes saplings of overstory trees, along with shrub species such as spicebush, witch hazel, alternate-leaved dogwood, chokecherry, red elderberry, and maple-leave viburnum. Herbaceous species include jack-in-the-pulpit, false Solomon's seal, Virginia waterleaf, zigzag goldenrod, enchanter's nightshade, and squawroot.

Once established, habitat elements associated with this community will benefit a variety of wildlife species. Mature oaks, hickories, walnuts and beech produce large quantities of nuts, which are eaten by squirrels, deer, wild turkey, songbirds and small mammals. Rough barked trees such as black locust, shagbark hickory, and oaks, provide foraging sites for bark-probing birds (e.g. brown creeper, nuthatches, black and white warblers), and food storage sites for species such as tufted titmouse and black-capped chickadee. Diversity in foliage height and structural complexity are desirable characteristics that contribute to bird species diversity. Another important habitat feature of mature forested areas is the presence of deadwood. Dead trees, branches and logs provide food and cover for a variety of wildlife species. The main function provided by fallen deadwood is as cover and as a site for feeding and reproduction. Branches provide escape cover for birds and rabbits, while logs provide hiding cover and feeding site for small mammals, reptiles and amphibians. Hollow logs are used as cover and food storage sites by species such as gray squirrel, red squirrel, chipmunk and raccoon. Fallen deadwood also harbors numerous insects and crustaceans which birds feed on. By trapping suspended sediments, adding organic material, and increasing water-

holding capacity, fallen deadwood improves soil quality and thus also benefits wildlife indirectly. Standing deadwood is also an important habitat component. It provides foraging sites for insectivorous birds such as woodpeckers, nuthatches, brown creeper, and black-and-white warbler. In addition, numerous species of North American birds nest and/or roost in cavities in dead or deteriorating trees. Mammals such as gray squirrel, flying squirrel and raccoon use cavities for shelter and reproduction, utilizing both live and dead trees, and migratory bats roost under loose bark.

Successional Old Field- The Restoration Concept proposes that small areas of this community be established throughout the gorge rim. This community is defined by Edinger et al. (2002) as "a meadow dominated by forbs and grasses that occurs on sites that have been cleared (for farming or development), and then abandoned." Although this community may not be representative of the original ecological state of the Study Area, it will support the ecological and cultural goals of this restoration project by enhancing habitat diversity and increasing opportunities for wildlife observation by the public. Dominant species in this community should include a variety of native forbs and grasses.

This community could provide habitat for bird species such as eastern meadowlark, bobolink, killdeer, horned lark, and several species of sparrow (vesper, savannah, grasshopper and Henslow's) and provides food (seeds) and nesting cover for many of these species. These open areas would also harbor abundant insect populations, creating important foraging sites for many breeding birds. Old field communities also provide habitat for eastern cottontail, woodchuck and numerous species of small mammal. These species provide a prey base for predators such as hawks, owls and fox.

Successional Shrubland- Although not explicitly called out in the Restoration Concept, transitional areas of successional shrubland will occur along the edges between forested and old field communities. Edinger et al. (2002) describes successional shrubland as a community that has at least 50 percent cover of shrubs, occurring on sites that have been cleared or otherwise disturbed. Characteristic shrub species can include gray dogwood, eastern red cedar, raspberries, serviceberries, choke-cherry, sumac, nanny-berry, and arrowwood (Edinger et al., 2002).

Once established, this community will provide nesting and escape cover for a number of bird species such as cuckoos, gray catbird, brown thrasher, eastern kingbird, yellow breasted chat, rufous-sided towhee, American goldfinch, indigo bunting, common yellowthroat, and blue-winged warbler. Berry-producing shrubs will provide a source of food for the mammals such as raccoon, skunk and opossum and birds such as robin, flicker, cardinal, blue jay, and cedar waxwing. The fruit also attracts insects, which in turn provide food for a variety of insectivorous birds such as flycatchers, vireos and wood warblers. Shrubland will also provide food and cover for mammals such as white-tailed deer, red fox and eastern cottontail.

Shrub Swamp and Shallow Emergent Marsh- It does not appear that large wetland complexes historically occurred along the gorge rim, however, small wetland communities were likely found in areas that collected/retained stormwater prior to alteration of the site. With topography restored on-site, low-lying depressional areas will once again collect water and support wetland communities such as shrub swamps and shallow emergent marshes. Shrub swamps are a broadly defined, common type of wetland dominated by one or more shrub species. Characteristic shrubs should include species such as alder, red osier dogwood, silky dogwood, willows, buttonbush, meadow-sweet, steeple-bush, gray dogwood, swamp azalea, highbush blueberry, spicebush, wild raisin, and arrowwood (Edinger et al., 2002). Shallow emergent marsh communities are dominated by herbaceous plants such as bluejoint grass, cattails, sedges, marsh fern, manna grasses, spikerushes, bulrushes, three-way sedge, sweetflag, tall meadow-rue, marsh St. John's wort, arrowhead, goldenrods, eupatoriums, smartweeds, marsh bedstraw, jewelweed, and loosestrifes (Edinger et al., 2002).

Wetland communities on the restored gorge rim would likely be fairly small and although species diversity is desirable, some of these wetland areas may simply consist of a small pocket of silky dogwood or cattails. These wetland communities could provide cover and nesting/ spawning areas for songbirds, frogs and turtles.

C. Cultural Improvements

The Restoration Concept envisions visitors being able to walk or bike through the restored ecosystem via a network of non-motorized multi-use trails. Where appropriate, trailheads are proposed at periodic intervals to increase public access to the gorge rim. Many of these are proposed to be "soft" trailheads, meant to accommodate local neighborhood access only. They are not designed to include visitor parking or large signs, but should instead feature a small clearing and pedestrian-scale trail entrance, with appropriately scaled directional signage. Larger trailheads would be provided at key locations and should have the ability to accommodate parking and pedestrian facilities such as bike racks and benches. Any necessary signage at trailheads or along the trail should be sensitive to the context of a restored, natural area; it should be unobtrusive, while providing clear guidance to all visitors.

The primary multi-use pedestrian trail, referred to as the Niagara Rim Trail, is proposed to run the length of the restored gorge rim, generally following the route of the former RMP. This trail would provide barrier-free access and passive recreation opportunities throughout the restored forests and meadows. As range of trail routing and surfacing options are available, but it is currently envisioned that the trail be constructed of compacted stone dust or similar low-maintenance materials, and not be any wider than is necessary to accommodate a single walking or biking lane in both directions. Native grasses and shrubs should be planted directly alongside the trail, and planted tree species should be close enough such that the canopies of mature trees provide a measure of cover over the trail. It is very important that the pedestrian trails do not act as a barrier to wildlife within the gorge and rim; the intent of the trail is to complement the restored ecological communities and provide public access to them, not to bisect them in the same manner as the existing roadway. Specific guidelines for the design and layout of the trail system are not provided within this study, as they should be determined based on future site survey, grading, and planting plans, along with input from both the community and restoration professionals. However, in general the trail should be compatible with best management practices regarding distance from sensitive ecological communities, intensity of maintenance, and preventing the transport of invasive species.

A more detailed description of the Restoration Concept is provided on the following pages. The Restoration Concept is divided into six sheets and each written description below corresponds with each sheet of Figure 3.0.

1. Lewiston Plateau/Earl W. Brydges Artpark and the Niagara Escarpment (Figure 3.1)

The northern end of the Study Area includes the portion of the RMP that runs along the Niagara Escarpment, and the Earl W. Brydges Artpark and Plateau Park, both of which are located on the Lewiston Plateau. The Restoration Concept proposes reforestation of the Niagara Escarpment and undeveloped areas in the Artpark and Plateau Park. Existing forested areas along the northern perimeter of the Artpark and Plateau Park will be expanded to serve as a green buffer between the adjacent residential and commercial areas to the north and the newly restored ecological communities to the south. Additional trails connecting the Niagara Escarpment to the Lewiston Plateau will facilitate pedestrian access to/from

the area, including connections with the Artpark trail system. Connection with the Artpark will offer visitors to that destination additional recreational opportunities on the gorge rim, thus providing the opportunity for an extended and more diverse visitor experience. A community trailhead is proposed at the corner of Fourth and Tuscarora Streets. This new trail will provide easy public access to areas within the Artpark that provide a unique view over the Niagara River (and, on a clear day, Lake Ontario). This multiuse recreational trail will provide a safe, accessible and continuous path along the Niagara gorge rim, linking the Village of Lewiston to the City of Niagara Falls (and Niagara Falls itself). This experience will include connections to scenic overlooks, existing trails, parks, and other areas of cultural and ecological significance, and could encourage the development of bike rental concessions, guided tours, and other tourism-related businesses in the adjacent communities.

Improved ecology: Successional old field/meadow will be maintained throughout much of Plateau Park, as well as parts of the southern portion of the Artpark and along Route 104/Lewiston Road. Limited areas of mowed lawn will be maintained between existing buildings along park access roads. A mixed deciduous forest will be restored/expanded along the Escarpment and throughout the undeveloped portions of the Artpark.

Improved pedestrian circulation: The Niagara Rim Trail proceeds along the gorge rim from a trailhead off Center Street in Lewiston. The existing trails in the Artpark and Plateau Park will be connected with new trails that provide access between the Escarpment, Lewiston Plateau and the Niagara gorge.

Reduced vehicular circulation: The RMP will be removed. The Artpark will keep its vehicular access roads. No additional roadways are proposed.

Improved neighborhood connection: Local neighborhood connections to the trail system will be provided at the intersection of 8th Street and Seneca Street and along Center Street near the southbound ramp for Route 104/Lewiston Road. The streetscape along 4th Street, at its intersection with the Artpark and three blocks north to Center Street in the Village of Lewiston, will be enhanced with native vegetation similar to what is found in the Artpark. The southbound Route 104/Lewiston Road access ramp will be treated similarly.

View east from Earl W. Brydges Artpark State Park.

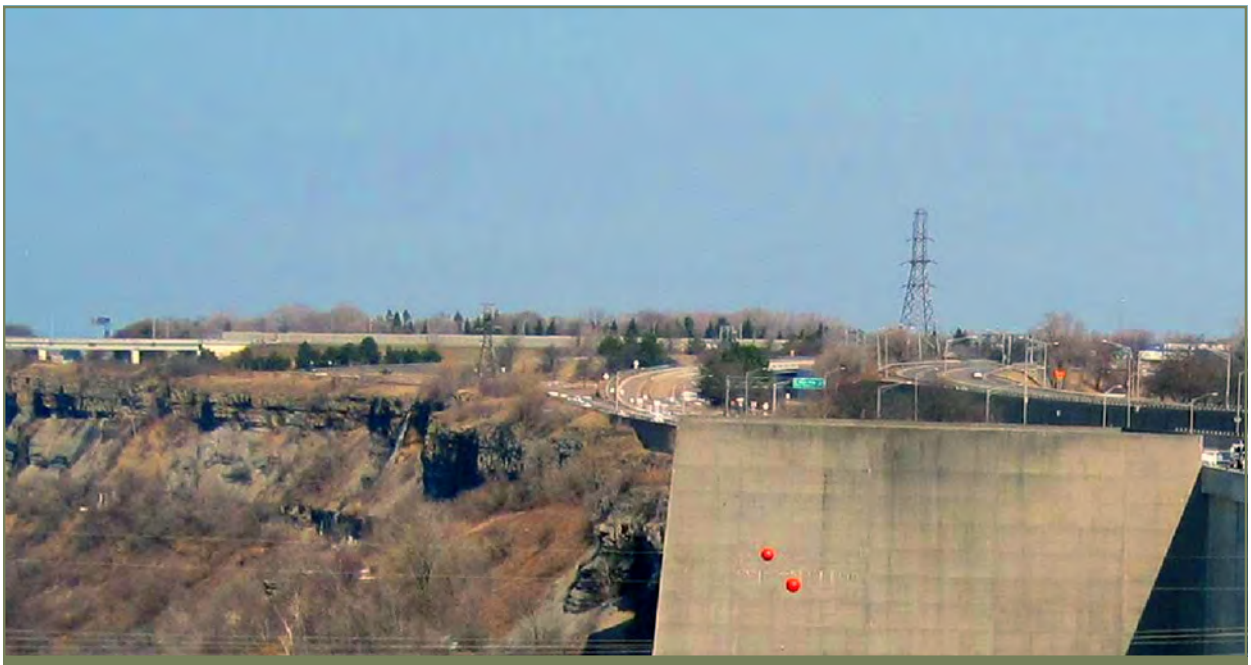
2. Niagara Escarpment – Niagara Falls Country Club to Robert Moses Niagara Power Plant (Figure 3.2)

Between the Niagara Falls Country Club and the Robert Moses Niagara Power Plant, there are some striking views available along the Niagara Escarpment. These views provide a one-of-a-kind scenic resource which belongs to the greater community and should be accessible to all visitors. The Niagara Rim Trail will provide access to scenic overlooks where users can take in these views. Although narrow, the section of the Study Area north of the Lewiston-Queenston Bridge is still wide enough to accommodate side trails off of the main Niagara Rim Trail. Soft trailheads are proposed to be located at the end of each residential street to provide easy, safe access for local residents. Though heavily influenced by the nearby I-190 interchange and Niagara Falls Country Club, reforestation of this area will provide needed screening of the I-190 interchange and the Country Club. A renewed and healthy forest will be an ideal complement to the unique geological footprint of the former Fish Creek. The day-lighting of Fish Creek is not currently proposed due to concerns relating to potential contamination and remediation issues. However, this option should be explored and implemented if found to be feasible. Restoration of a natural stream channel in this area would have ecological as well as aesthetic benefits. The Niagara Rim Trail continues through this section of the corridor, providing users with views of the exposed Niagara Escarpment, calcareous cliff communities in the gorge, and a sense of the power of the hydrologic patterns that gave shape to the land.

Improved ecology: The forest along this section will be encouraged to mature into a mixed deciduous forest, with the densest section south of the Lewiston-Queenston Bridge. The feasibility of day-lighting Fish Creek should be explored. All of the soft trailheads will be characterized by small meadows.

Improved pedestrian circulation: The Niagara Rim Trail will continue along the rim mostly parallel to the existing walking trail.

Reduced vehicular circulation: The RMP will be removed and no additional vehicular circulation is recommended in this section of the gorge rim.



View north from the NYPA Power Vista at the Robert Moses Niagara Power Plant.

Illustration of future Fish Creek overlook looking south along the Niagara River (see Figure 3.2 for location of illustrative view).

Improved neighborhood connection: Soft trailheads will be located at each end of Fort Gray Drive. Reforestation of this area will provide a buffer between the residential neighborhood and the Niagara Rim trail.

3. Devil's Hole State Park/Power Vista (Figure 3.3)

This section of the Study Area includes all of Devil's Hole State Park and the NYPA Power Vista, both of which are local tourist destinations. Portions of Devil's Hole State Park bisected by the RMP will be reconnected. Reforestation of the Niagara gorge rim will continue south of the Power Vista and into Devil's Hole State Park. With the removal of the RMP and inclusion of the new Niagara Rim Trail, all of Devil's Hole State Park will now be accessible to pedestrians. Implementation of the Restoration Concept will enhance both the Park and the Power Vista as regional tourism destinations by simplifying vehicular access to the Park, improving the pedestrian experience between the two attractions, and creating a more unique view from atop the nearby pedestrian overpass.

In an effort to reduce hardscape and to eliminate conflict points between vehicles and pedestrians, the two existing parking areas, which currently straddle the RMP, should be combined into one parking lot east of the proposed Niagara Rim Trail. This will reduce the impact of vehicles on the gorge rim ecosystem, provide easier vehicular access to the park from Route 104/Lewiston Road, and improve pedestrian safety and connectivity. From this parking area motorists can easily access alternative routes south to Niagara Falls including Highland Avenue and Hyde Park Boulevard. The existing pedestrian overpass above the parkway will be adapted to serve as an attraction for visitors to view the restored gorge rim from within the tree canopy (see illustration). Retaining the pedestrian bridge also provides a "historical bridge" from the era of transportation-focused land uses to the ecologically-centered uses proposed along the restored gorge rim. Similarly, the vehicular bridge over the NYPA's service drive will be transformed into a "green trail" carrying the landscape across the gap, reconnecting the currently fragmented ecosystem, and offering

View north from existing pedestrian overpass in Devil's Hole State Park.

Illustration of future view north from the pedestrian overpass (see Figure 3.3 for location of illustrative view).

a glimpse down into the gorge via the rock cut that accommodates the service drive.

The park will include restored forest land and meadows, as well as small areas of maintained parkland along the north edge of the pedestrian trail, to provide visitors with amenities for relaxation and passive recreation in a setting with dramatic scenic views. The Niagara Rim Trail will be accessible from the adjacent neighborhood and will be connected to existing trails that access the gorge.

Improved ecology: Small successional old field/meadow communities will be located at the soft trailhead near Lafayette Avenue. A mixed deciduous forest will be restored alongside the multi-use trail and at

Devil's Hole State Park. Within the park a small area of mowed lawn will be maintained near the edge of the gorge rim to accommodate picnics and informal recreational use. Native herbaceous species typical of old field/meadow ecological communities will be established on the bridge over the NYPA service drive.

Improved pedestrian circulation: The Niagara Rim Trail will continue through this section connecting with the popular trails that lead down the gorge to the river. The new trail will connect with the pedestrian overpass, allowing for a canopy experience, and providing access to that portion of Devil's Hole State Park located near the Power Vista. The parking lot will be strategically connected to Lewiston Road offering easy access and parking for visitors traveling by car without interrupting or interfering with the Niagara Rim Trail. This will facilitate visitation by tourists and eliminate existing conflicts between pedestrian and vehicular circulation.

Reduced vehicular circulation: The RMP will be removed. The two existing parking lots will be combined into one, which will be directly accessible from Route 104/Lewiston Road.

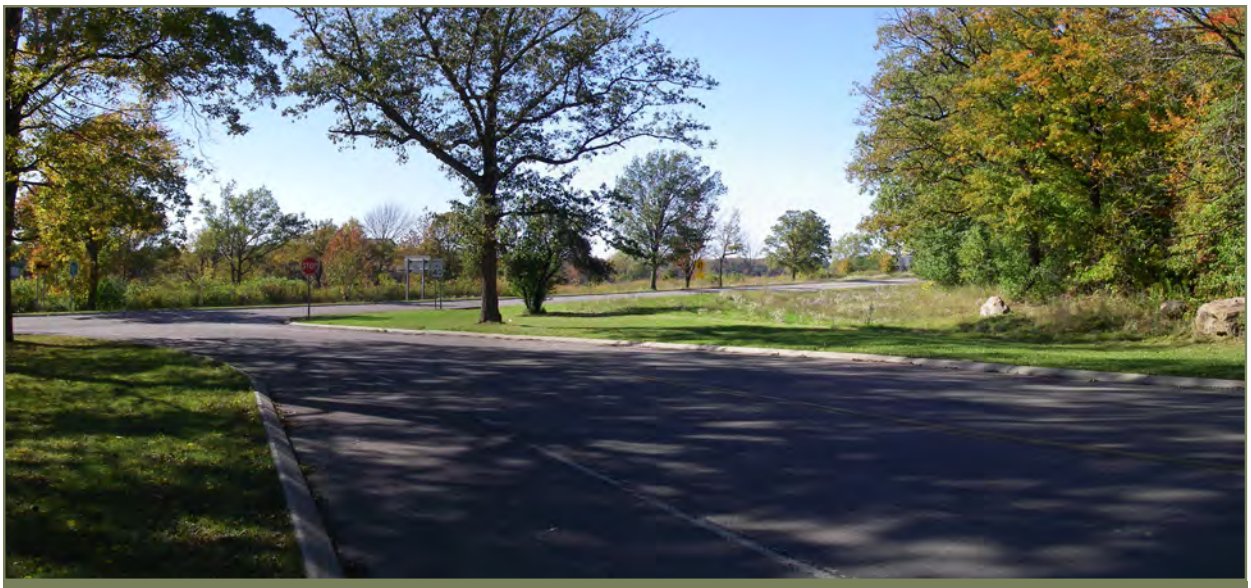
Improved neighborhood connection: Access to the Niagara Rim Trail is proposed to be provided to local residents in the adjacent neighborhood with a soft trailhead at Lafayette Avenue.

4. Whirlpool/DeVeaux Woods State Parks (Figure 3.4)

Whirlpool State Park and DeVeaux Woods are separate but adjacent parks within the Study Area. With removal of the RMP (and associated vehicular traffic) and with proper reforestation and restoration, these two parks would be joined, and could become a significant woodland and destination node within the Study Area. A portion of the cleared areas within DeVeaux Woods State Park (including existing mowed lawns and under-utilized buildings) could be an ideal location for a greenhouse/nursery for rearing plants to be used during restoration. This area offers ample existing infrastructure to house potential educational outreach facilities. Prior to construction of the RMP, the forests in both parks were a connected ecosystem, which was bisected by the RMP. This led to the slow decline of this forested ecosystem. Ecological restoration within this area will focus on restoring a natural species composition and structure to the forest, including a healthy understory, and will reconnect the two forests, creating a larger contiguous stand.

With the removal of RMP, pedestrians will no longer need to cross two lanes of 45 mph traffic to get to Whirlpool State Park. Vehicular access to Whirlpool State Park will be provided by a new scenic gateway from Findlay Drive. Improvement and identification of this entrance will enhance visitation by tourists visiting the area, and provide a connection with the surrounding community for users of the Niagara Rim Trail. Although the trail and driveway will intersect, the intersection will be designed to indicate trail users receive the right of way and all vehicles need to stop for trail users. Entranceways to both Whirlpool State Park and DeVeaux Woods State Park will be landscaped to invite visitation and blend with the surrounding naturalized area.

Pedestrian connectivity to the trail system from adjacent residential neighborhoods will be enhanced with five soft trailheads, four located north and the fifth located south of DeVeaux Woods. Whirlpool Drive will terminate at Chestnut Avenue and will be enhanced as the local connector along the west side of Niagara Falls, providing an attractive interface between the renewed gorge rim and adjacent neighborhoods. Suggested Whirlpool streetscape enhancements may include native street tree plantings, sidewalks, crosswalks, neighborhood trail head connections, wayfinding signage, on-street parking, and/or bicycle lanes. Such improvements will strengthen the interface between the park and adjacent neighborhoods, and set the stage for the ancillary benefits of public space beautification to migrate outward from these spaces.

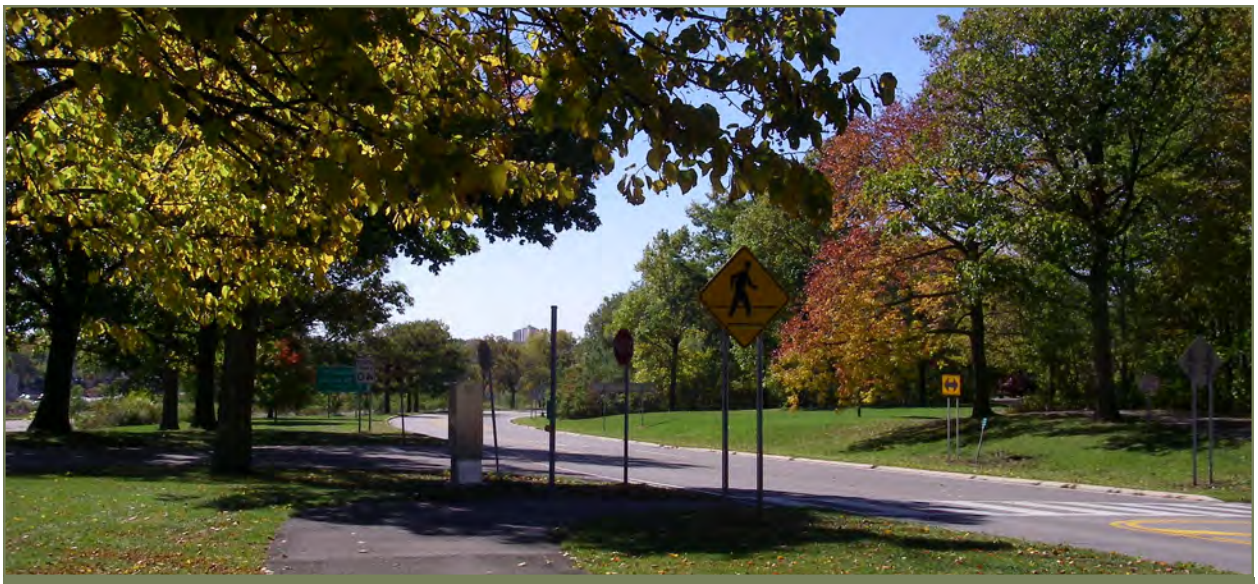


View along Findlay Drive at intersection with Robert Moses Parkway.

Illustration of future view along the Findlay Drive gateway toward Whirlpool State Park (see Figure 3.4 for location of illustrative view).

Improved ecology: A mixed deciduous forest will be nurtured and expanded throughout much of Whirlpool State Park and DeVeaux Woods State Park, with some meadows and small areas of mowed lawn at Whirlpool State Park.

Improved pedestrian circulation: The Niagara Rim Trail will continue through the restored forest, connecting with existing gorge trials to the river and the pedestrian walkway from DeVeaux Woods. Sidewalks will be provided along the Findlay Drive gateway to Whirlpool State Park. Soft trailheads will be provided at certain neighborhood streets adjacent to the Study Area.



View along Robert Moses Parkway at Whirlpool State Park Driveway.

Illustration of future intersection of the Niagara Rim Trail with the proposed Findlay Drive gateway to Whirlpool State Park (see Figure 3.4 for location of illustrative view).

Reduced vehicular circulation: The RMP will be removed. Whirlpool State Park access driveway will be rerouted to directly connect with Findlay Drive, thus maintaining easy access to this destination for residents and tourists. Whirlpool Street will terminate at Chestnut Avenue.

Improved neighborhood connection: Soft trailheads will be located at Harrison, James, Maple, Vanderbilt, and Chestnut Avenues.

5. Elevated Niagara Rim Trail (Figure 3.5)

The point where the RMP meets the Whirlpool Bridge is a transportation crossroads with historic significance. Today there are two bridges over the Niagara gorge, one for cars and one for the railroad. The RMP overpass currently crosses over both of these bridges. As part of the Restoration Concept, this elevated section of roadway is proposed to be retained to create a distinctive landscaped pedestrian amenity, repurposing the roadway infrastructure as an elevated "green corridor" with a one-of-a-kind bird's-eye view of the Niagara gorge and Canada. With the appropriate techniques (similar to those employed to create "green roofs") the overpass will become a naturalized corridor and scenic overlook, providing recreationalists and tourists with a rare vantage point from which to view the natural wonder of the Niagara gorge. This repurposed infrastructure will be a unique showpiece for walkers, hikers, runners and bicyclists along the Niagara Rim Trail. The elevated trail has exceptional potential to draw visitors from throughout the bi-national region, especially in light of transit improvements currently underway at the site of the former Customs building on Whirlpool Street.

View south toward elevated portion of Robert Moses Parkway.

Illustration of conceptual Niagara Rim Trail viewing south toward elevated trail (see Figure 3.5 for location of illustrative view).

At strategic neighborhood streets, pedestrian connections will be enhanced to facilitate connectivity from the City's urban core to the proposed pedestrian trail system. Suggested streetscape enhancements may include planting native trees along the streets, improving sidewalks, designating crosswalks, providing trailhead connections, and installing way-finding signage. These improvements will work to reconnect urban neighborhoods with the adjacent parks and restored ecosystems along the gorge rim, and the visitors using this area.

Improved ecology: Native meadow species will be planted on the "pedestrianized" overpass, with meadows serving as gateways at each trailhead. Appropriately hardy native tree and shrub species will be located along improved streetscapes.

Improved Pedestrian circulation: The Niagara Rim Trail will continue through this section and will include the pedestrianized overpass. The trial will connect to existing walking trails down the gorge to the river. Safe and easy access to the trail will be provided at the end of designated neighborhood streets.

Reduced Vehicular circulation: The RMP will be removed, with the exception of the elevated overpass, which will be converted for non-motorized uses.

View of the Robert Moses Parkway. Automobile access is limited to the original northbound lanes in the foreground, with pedestrian access granted to the original southbound lanes at left.

Illustration of conceptual Niagara Rim Trail viewing north near elevated trail (see Figure 3.5 for location of illustrative view).

Neighborhood connection: The pedestrianized overpass will establish a new community landmark, while the enhanced streetscape along Ontario and Willow Avenue will provide deeper connections with adjacent residential and commercial areas. More frequent trailheads will improve access to the Niagara Rim Trail at Bellevue, Ontario, Willow, Ashland, and Willow Avenues, and the improved streetscape along Whirlpool Street will provide a buffer and help define pedestrian access.

6. Proposed Niagara Gorge Discovery Center (Figure 3.6)

The southern end of the Study Area has been addressed in the City of Niagara Falls' comprehensive plan (City of Niagara Falls, 2009a). The intent is to have the Niagara Rim Trial connect to this area, thus providing a seamless experience for Discovery Center visitors and trail users. Restored ecological communities will be carried along the rim up to and within the redesigned Niagara Gorge Discovery Center and Aquarium area. This area will be redesigned and configured as recommended in the City's comprehensive plan. The removal of the RMP and the creation of a "Cultural District" will help strengthen and link existing natural and cultural attractions into a world class park setting.

According to the 2009 comprehensive plan, attractions would include the Niagara Gorge Discovery Center, gorge overlooks, trails, recreation and festival areas, the expanded aquarium, shared surface and subsurface parking facilities, an outdoor performance amphitheater, a summer pond and winter skating rink, and a stormwater management area. The streetscape for Whirlpool Street will be enhanced with design details similar to those used to enhance the strategic east-west neighborhood corridors (such as Pine Street and Cedar Street) to facilitate pedestrian movement between the city's urban mixed-use corridor along Main Street and the new Cultural District.

This is an ideal location for elements of the City and its parks to interrelate with one another. In the words of urban designer Kevin Lynch, such nodes are strengthened by the presence of landmarks, and "provide a setting which almost guarantees attention for any such mark" (Lynch, 1960). Throughout this portion of the gorge rim, the Niagara Rim Trail will be not only a path, but a landmark in its own right. It will be enhanced by the presence of other destinations and attractions along its length, and could lend further support to ancillary economic opportunities such as bicycle rentals or concessions. The Niagara Rim Trail

View of the existing Niagara Gorge Discovery Center.

will be used to connect the built and natural environments, and to draw people into the restored landscape.

Improved ecology: A mixed deciduous forest will be nurtured along the western and southern portion of the rim, with meadows and shrubland scattered throughout the central and northern portion of the proposed Cultural District. The stormwater management area is proposed to be developed and maintained as a shallow emergent marsh.

Improved pedestrian circulation: The Niagara Rim Trial will continue through and connect with the pedestrian systems within the Niagara Discovery Center complex.

Reduced vehicular circulation: The RMP will be removed. Whirlpool Street will be removed from Cedar Avenue to Route 104/ Main Street. Vehicular parking is proposed within the Discovery Center complex.

Improved neighborhood connection: Formalized park entranceways are proposed to be located at or near existing/proposed structures. Pedestrian connections between the Discovery Center, the restored gorge rim, and residential and commercial areas will be improved through streetscape enhancements along Route 104/Main Street, Whirlpool Street, Pine Street, and Cedar Avenue.

2. Restoration Benefits

As discussed in Part II of this study, removal of the RMP will create a one-time cost and temporary inconvenience. However, these must be measured against the costs and benefits of either reconstructing and maintaining the RMP, or removing the roadway restoring the gorge rim. The essential question is what benefits could come from removing the RMP and restoring the Niagara gorge rim to a healthy, natural setting with a recreational trail? In addition, will these potential benefits outweigh the costs (and perceived inconveniences) of removing the RMP? Full removal and restoration would take significant financial resources, physical effort, and community dedication. Before such resources are committed, there should be a confident understanding of the benefits that will be derived from restoring this area. How would the proposed restoration of the gorge rim impact the community from an environmental, economic and cultural perspective? With the intent of addressing this question, the potential environmental and socio-economic benefits of the proposed ecological restoration concept are discussed below.

A. Environmental Benefits

1. General Environmental Benefits

Ecological restoration of the Niagara Rim will result in a variety of ecological/environmental benefits, including the following:

- Improved soil quality
- Improved water quality
- Improved quality and quantity of stormwater run-off
- Improved plant species diversity
- Improved local air quality and microclimate
- Improved wildlife habitat
- Reduced noise
- Improved scenery/aesthetics
- Improved open space and recreational opportunities

The question is to what degree will the environmental benefits be realized and can they be quantified? Implementation of the proposed Restoration Concept will replace 350 acres of disturbed/developed land (including 38 acres of pavement) with native ecological communities, and restore the health and vitality of the remaining communities within the Study Area. The removal of pavement, decompaction/restoration of a natural soil profile, and replacement of mowed lawn with native vegetation will undoubtedly improve water infiltration thus reducing stormwater run-off (Holman-Dodds et al., 2003). This in turn will reduce the transport of pollutants and sediments to receiving waters (Niagara River), facilitate water up-take by on-site vegetation, and provide additional groundwater recharge (Barnes et al., 2009; Brauman et al., 2007). The removal of vehicles and pavement, and the establishment of native vegetation will also provide local air quality and microclimate benefits through the reduction of vehicle emissions, increased shading, increased carbon dioxide up-take, and filtering/absorption of air-borne pollutants (McPherson & Rowntree, 1993; Peters & McFadden, 2010; Rowntree & Nowak, 1991; Tyrvainen et al., 2005).

Once established in the Study Area, restored plant communities will create additional habitat for area wildlife. The native plants will provide an increased diversity of food sources and cover types, and provide

a natural buffer between the Niagara gorge and adjacent developed areas. As discussed previously, open meadows and shrubland will provide nesting and foraging habitat for birds and mammals that prefer grasslands and early successional habitat. Enlarged forest areas will increase the size and contiguity of existing woodlands, and provide connections/travel corridors between isolated forest remnants (e.g., DeVeaux Woods) and forest vegetation in the Niagara gorge. Natural forest habitat features anticipated to develop over time, such as standing and fallen dead wood, increased foliage height diversity, tree cavities, and leaf litter, will all enhance habitat quality and diversity, and allow the gorge and rim to accommodate a wider variety of wildlife species that prefer forest and forest edge conditions. Removal of the RMP will also eliminate a potential source of road kill and provide safe movement of wildlife using the gorge rim.

In addition to the ecological benefits described above, restoration of the Study Area will also have environmental/quality-of-life benefits for area residents and visitors. Removal of vehicular traffic from the rim will reduce noise, improve safety, and allow unhindered pedestrian access to and along the Niagara gorge rim. Removal of the paved roadway and establishment of restored native ecosystems will provide enhanced open space, wildlife viewing opportunities, improved aesthetics, and enhanced property values along the Niagara gorge rim. Improved pedestrian access to a multi-use pedestrian trail (free of cars) will also enhance recreational opportunities for residents and provide a new and different destination for tourists visiting the area.

2. Ecosystem Services

As humans we benefit from a number of processes and resources that are supported by natural ecosystems. These benefits are referred to as ecosystem services and include clean water, clean air and any number of other benefits that people receive from the ecosystems that surround and sustain them (Millennium Ecosystem Assessment, 2005). Ecosystem services can be divided into four general categories:

Provisioning services: These are the benefits experienced through harvesting or consuming ecological resources, such as food and fiber.

Regulating services: These benefits arise from the interaction of a particular resource with other environmental forces or factors, such as flood control, waste processing, or climate control.

Cultural services: These are the products of non-consumptive human interaction with the environment, such as our spiritual connection with, or aesthetic enjoyment of, the landscape.

Supporting services: These are the core biological "outputs" stemming from the interaction of flora and fauna with their respective energy "inputs", such as photosynthesis and soil formation.

Measuring benefits from improved ecosystems has evolved from a general discussion of observed benefits to establishing an economic value for these benefits. Many ecosystem services (such as supporting services) are difficult to measure. These include many of the aesthetic and spiritual benefits that often accompany human interaction with the environment. However, many of the regulating services can be objectively measured and can help to quantify the overall public benefits of ecological restoration. Among these regulating services are the important functions that trees serve with regard to the regulation of microclimate and mitigation of air pollution. Trees help to moderate hot and cold air temperatures, which partially alleviates the need for increased energy production, preventing the release of additional emissions into the atmosphere. In addition, trees absorb pollutants from the soil, water, and air, through phytoremediation.

As the study of ecosystem services has evolved, several models have been introduced to measure the

economic values associated with regulating services in particular (Nelson & Daily, 2010; Holdren et al., 2011; The Nature Conservancy, 2011). One approach in developing these economic valuation models is to examine consumers' willingness to pay for the services rendered by ecological functions. This is the approach taken in the U.S. Forest Service's Northeast Community Tree Guide: Benefits, Costs, and Strategic Planning (McPherson et al., 2007). Since federal air quality standards require the mitigation of certain pollutants, and since their removal comes at a substantial cost to the public, it is possible for the Forest Service to quantify the economic value of the regulating services of forests. In the Northeast Community Tree Guide, the Forest Service has examined the abilities of representative tree species to mitigate hot and cool weather, wind, and common air pollutants, as well as their ability to intercept rainfall from entering water treatment facilities, and measured these services for their potential impact on utility customers. The Forest Service estimates a single small deciduous tree provides enough air temperature mitigation over the course of a year to avoid the production of 17 kWh of electricity and 806 cubic feet of natural gas. The subsequent savings attributable to 1,000 such trees over 40 years is more than $132,000 for electricity and $393,000 for natural gas. In other words, the more trees in an area, the less money spent on electricity or natural gas to mitigate the hot or cool weather.

That same tree will also remove pollutants from the air, both directly and indirectly. The Forest Service estimates that a small deciduous tree can remove 0.15 lbs of sulfur dioxide from the air each year, through a combination of avoided energy production and pollutant uptake. The public pays $3.48 for each pound of sulfur dioxide it removes from the atmosphere through other mitigation strategies (McPherson et al., 2007). After 40 years, the same small tree will save the public $20.88, and thus 1,000 such trees will result in $20,880 in savings.

Similarly, trees intercept a portion of rainfall, holding it on leaves and branches, thus reducing runoff entering the municipal sewer system. As trees absorb groundwater through their root systems, they also support the infiltration capacity of soil, which diverts more rainfall from the system. The Forest Service estimates that each intercepted and absorbed gallon of stormwater saves the public $0.008, and that a single small deciduous tree intercepts and absorbs 358 gallons per year. The amount of intercepted and absorbed stormwater from 1,000 small deciduous trees over a 40-year span thus saves more than $114,000.

Table 3 examines one method of estimating the economic impact of ecosystem services that would be provided by planting 21,000 trees throughout the RMP corridor, based on research performed by the Forest Service. For the purposes of this exercise, some assumptions must be made regarding the coverage of trees throughout the restored gorge rim:

- Table 3 assumes that 60% (210) of the 350 total acres of disturbed/developed and mowed lawn/ornamental ecological communities noted in Part I will be restored to a mixed deciduous forest condition.
- The tree density of restored forest within the Study Area (100 trees/acre) is assumed to be consistent with average characteristics for similar established forests as described in Martin (1992).
- Of the 21,000 modeled trees, 40% (8,400) are assumed to be large deciduous trees, and the rest are assumed to be evenly split (20% each, or 4,200) between small deciduous, medium deciduous, and a representative conifer species.
- It is further assumed that the understory, herbaceous layer, and all other flora and fauna will be associated with additional ecosystem services and maintenance obligations; however, those services and costs are not examined here.

Actual costs and benefits per tree per year may vary from published averages. For example, Forest Service

Table 3: Estimation of Ecosystem Services Resulting from Restoration of the Gorge Rim

Estimated Ecological and Economic Benefits of Reforestation over 40 Years^												
		Small deciduous[a]		**Medium deciduous[a]**		**Large deciduous[a]**		**Conifers[a]**		**Total reforestation**		
		Count:	4,200	Count:	4,200	Count:	8,400	Count:	4,200	Total count:		21,000
Energy & environmental benefits	**Price**	**Resource Units**	**Total Value**	**Resource Units**	**Total Value**	**Resource Units**	**Total Value**	**Resource Units**	**Total Value**		**Total value**	**Share of total benefits**
	Dollars	RU / tree / year	Dollars	RU / tree / year	Dollars	RU / tree / year	Dollars	RU / tree / year	Dollars	Dollars / tree / year	Dollars	Percent
Electricity (kWh)[b]	0.1955	17	$558,348	39	$1,280,916	88	$5,780,544	25	$821,100	$10.05	$8,440,908	19.1
Natural gas (kcf)[c]	12.22	0.806	$1,653,941	1.523	$3,126,326	2.831	$11,623,465	1.503	$3,086,422	$23.20	$19,490,154	44.0
Net carbon dioxide (lb)	0.0033	144	$79,834	250	$138,600	485	$537,768	218	$120,859	$1.04	$877,061	2.0
Ozone (lb)	4.59	0.14	$107,957	0.29	$223,625	0.54	$832,810	0.28	$215,914	$1.64	$1,380,305	3.1
Nitrogen dioxide (lb)	4.59	0.18	$138,802	0.37	$285,314	0.7	$1,079,568	0.34	$262,181	$2.10	$1,765,865	4.0
Sulfur dioxide (lb)	3.48	0.15	$87,696	0.40	$233,856	0.85	$993,888	0.23	$134,467	$1.73	$1,449,907	3.3
Small particulate matter (lb)	8.31	0.13	$181,490	0.33	$460,706	0.45	$1,256,472	0.37	$516,550	$2.88	$2,415,218	5.5
Volatile organic compounds (lb)	2.31	0.01	$3,881	0.03	$11,642	0.06	$46,570	0.02	$7,762	$0.08	$69,854	0.2
Hydrology (gal)	0.008	358	$481,152	1,156	$1,553,664	1909	$5,131,392	909	$1,221,696	$9.99	$8,387,904	18.9
Total environmental benefits			*$3,293,100*		*$7,314,650*		*$27,282,477*		*$6,386,950*		*$44,277,176*	*100.0*
Installation & maintenance costs	**Per tree**	**Total Value**	**Per tree**	**Total Value**	**Per tree**	**Total Value**	**Per tree**	**Total Value**	**Per tree**	**Total Value**	**Share of costs**	
	Dollars / tree / year	Dollars	Dollars / tree / year	Dollars	Dollars / tree / year	Dollars	Dollars / tree / year	Dollars	Dollars / tree / year	Dollars	Percent	
Tree and planting[d]	$5.93	$995,400	$6.00	$1,008,000	$7.45	$2,503,200	$5.00	$840,000	$254.60	$5,346,600	26.8	
Pruning	$3.26	$547,680	$7.96	$1,337,280	$11.60	$3,897,600	$6.40	$1,075,200	$326.56	$6,857,760	34.4	
Remove and dispose	$1.28	$215,040	$1.62	$272,160	$2.06	$692,160	$1.47	$246,960	$67.92	$1,426,320	7.2	
Pest and disease	$0.09	$15,120	$0.13	$21,840	$0.17	$57,120	$0.11	$18,480	$5.36	$112,560	0.6	
Infrastructure repair	$1.13	$189,840	$1.55	$260,400	$2.06	$692,160	$1.37	$230,160	$65.36	$1,372,560	6.9	
Cleanup	$0.26	$43,680	$0.35	$58,800	$0.46	$154,560	$0.31	$52,080	$14.72	$309,120	1.5	
Administration / inspection/ other	$3.96	$665,280	$5.42	$910,560	$7.21	$2,422,560	$3.10	$520,800	$215.20	$4,519,200	22.7	
Total installation & maintenance costs		*$2,672,040*		*$3,869,040*		*$10,419,360*		*$2,983,680*		*$19,944,120*	*100.0*	
Net benefit		**$621,060**		**$3,445,610**		**$16,863,117**		**$3,403,270**		**$24,333,056**		

^Based on values as calculated by McPherson et al (2007), unless noted otherwise. Annual values incorporate effects of tree loss through mortality.

[a]Resource units as calculated by McPherson et al (2007) for public (street and park) trees only. Public trees are not assumed to provide direct shade onto adjacent buildings.

[b]Price source: US Energy Information Administration, July 2010 NYS avg. residential retail price (http://www.eia.gov/electricity/data.cfm#sales

[c]Price source: US Energy Information Administration, Feb 2011 NYS avg. residential retail price (http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_SNY_m.htm); US Forest Service values converted from kBtu to kcf.

[d]Price source: NYS DOT Regional and Statewide Weighted Average Awarded Prices, July 2009-June 2010.

figures may reflect the cost of a more active forest management regime than would likely be implemented by NYSOPRHP, which employs a more "passive management" approach to its undeveloped forestlands (Ash, 2009). As a consequence, the maintenance costs shown in Table 3 may be higher than those NYSOPRHP would incur. However, a well-designed, diligent, and comprehensive restoration effort may justify such higher estimates as those provided by the Forest Service.

Altogether the 21,000 trees established through implementation of the Restoration Concept would result in more than $44 million in total savings from utility costs and pollution mitigation over the course of 40 years. Estimated costs for installation and maintenance of these trees are also provided in Table 3.

Long-term maintenance costs are based on estimates developed by the Forest Service (adjusted to local conditions as noted), for activities such as removal, disease control, infrastructure repair, cleanup, and inspection (although all of these may not be necessary for the gorge rim restoration). Based on these estimates the total cost of installation and maintenance for the 21,000 trees described here would total around $20 million over the forty year span, resulting in a net benefit of more than $24 million.

B. Cultural Benefits

Just as certain environmental benefits are objectively assigned economic value, so too can one quantify some of the economic and cultural benefits conservation lands, parks, trails and open space have on adjacent properties and communities. Some of the economic and cultural benefits associated with the removal of the RMP and ecological restoration of the gorge rim include the following:

1. Regional employment opportunities
2. Increased property values
3. Increased tourism/ecotourism
4. Increased park use
5. Health value
6. Quality of life
7. Traffic-related benefits

Two of these factors provide a revenue source to local government; 1) property tax revenue from the added value of lands in proximity to parks, and 2) sales tax revenue due to increased spending by tourists who visit the region primarily because of its parks. Together these factors can increase the overall "wealth" in a community and give critically needed financial resources to government to support public services and investments.

Three other factors provide direct savings to residents. The first is the value of residents' free use of the park for enjoyment and recreation. The second is the health benefits (savings in medical costs) resulting from activity and exercise that occurs in the parks. The third factor is community cohesion, which is the result of people working together to collectively save or improve a park. This type of community effort can result in a stronger sense of community stewardship and can reduce antisocial behavior.

As part of this study, a preliminary economic analysis was performed by HB Solutions to examine the potential direct and indirect impacts of roadway removal on regional business and development prospects (Appendix C). While it is difficult to precisely quantify the actual economic benefits that will result from a restored gorge rim, this study examines the current economic context of the region and suggests ways in which those benefits could be realized throughout the area, based on reasonable assumptions and observed impacts experienced elsewhere.

1. Regional Employment Opportunities

According to this analysis, removal of the RMP offers the City of Niagara Falls the opportunity to leverage a slight increase in local traffic (if it increases at all) into improved exposure of economically productive areas, such as business districts and recreational nodes. It is expected that full removal will support investment and

revitalization initiatives throughout the Main Street and Downtown business districts of the city, as well as improved pedestrian connections throughout adjacent residential areas.

As discussed in greater detail in Appendix C, the removal of the RMP will generate both direct and indirect economic benefits in various sectors. In the near-term, the phased removal of the RMP and restoration of the gorge rim may also represent a direct (and potentially substantial) opportunity for regional businesses. Direct employment related to roadway removal will involve workers in the engineering, construction/ demolition, transportation, and waste management industries. The design and implementation of the restoration concept presented in this study will require professionals in these industries and more, including professionals in the fields of ecology and resource protection, botany, horticulture/plant propagation, landscape architecture, as well as assorted technicians in each field. Increases in each of these employment

Table 4: Selected Niagara County Industrial Sub-sectors, 2009

Sub-sector description (NAICS*)	Paid employees for pay period including 3/12/09^	First-quarter payroll($1,000)	Annual payroll($1,000)	Total establishments	Number of establishments by employment-size class					
					1 - 4	5 - 9	10 - 19	20 - 49	50 - 99	100 or more
Highway, street, and bridge construction	26	281	2,387	8	6	1	1	0	0	0
Other heavy and civil engineering construction	[0-19]	D	D	1	1	0	0	0	0	0
Site preparation contractors	151	1,629	10,640	24	19	1	1	3	0	0
All other specialty trade contractors	145	990	7,394	39	34	2	1	2	0	0
General freight trucking, local	44	279	1,408	10	7	0	3	0	0	0
Specialized local freight trucking (except used goods)	[20-99]	417	2,238	21	15	4	2	0	0	0
Scenic and sightseeing transportation, land	52	248	2,031	4	1	1	0	2	0	0
Landscape architectural services	[0-19]	49	208	5	5	0	0	0	0	0
Engineering services	445	7,658	28,683	23	13	3	2	3	1	1
Environmental consulting services	74	1,675	6,028	10	6	2	1	1	0	0
Other scientific and technical consulting services	[0-19]	83	237	4	4	0	0	0	0	0
Other physical and biological research	[0-19]	D	D	2	1	1	0	0	0	0
Landscaping services	200	1,067	7,291	101	91	6	3	1	0	0
Remediation services	[500-999]	D	D	8	3	1	1	1	1	1
Materials recovery facilities	[20-99]	D	D	2	1	0	0	1	0	0
Environment, conservation and wildlife organizations	[0-19]	D	D	1	0	0	1	0	0	0

Source: U.S. Census Bureau, County Business Patterns 2009
***North American Industrial Classification System**
^ Values in brackets [] indicate ranges, used to maintain anonymity of individual companies
D=with held to avoid disclosing data for individual companies

sectors are known to have "ripple effects" throughout a regional economy by virtue of their positive impacts on personal income and potential for increased spending (USDC, 1997).

Long-term management of the restored ecosystem, trails, and adjacent parkland will likely be the responsibility of the NYSOPRHP, and may require increases in that agency's staffing and budgetary resources. NYSOPRHP expenditures in the Niagara Frontier region during fiscal year 2008-9 totaled $30.4 million; these expenditures have been estimated to support 454 jobs within the region, with a total employee income of $24.2 million (Heintz et al., 2009). Increases in operational and capital expenditures related to parks are known to have positive impacts on local economies. These impacts can be greatest when the responsible agency is a non-local government entity (such as the NYSOPRHP), and when that agency focuses on local procurement of goods and services (Nadel, 2005).

An ecologically restored Niagara gorge rim could potentially influence economic growth throughout Niagara County. When viewed from that regional perspective, the restoration of the Niagara gorge rim looks like a healthier economic option. Table 4 highlights the employment context for the relevant sub-sectors within Niagara County as of 2009. While it is yet not possible to estimate the full impact ecological restoration of the Niagara gorge rim may have on the regional labor market, these employment figures may provide insight into the industry sub-sectors that currently exist within the county that could be utilized in the implementation phases.

It is also worth noting what industry sub-sectors are not currently represented within the county, as any necessary services within those fields would require the creation or expansion of new businesses in the area, or the associated employment benefits accruing outside the region. These include, but are not limited to: nursery and tree production; forest nurseries; forestry support services; and geophysical surveying and mapping services. Many of these employment opportunities (such as environmental consulting, forestry support services, etc.) will extend well beyond the removal and restoration phases, as periodic maintenance will be performed on the restored ecosystem.

Additionally, the overall employment impact of the ecological restoration will extend into other employment opportunities, such as travel and tourism. The New York State Department of Labor estimates that the travel and tourism "cluster" directly employs 5,110 positions in Niagara County (NYSDOL, 2011). This cluster is comprised of a percentage of employment in the accommodations, culture/recreation/amusements, food service, passenger transportation, and travel retail sub-sectors. These positions represent indirect employment opportunities related to the restoration of the gorge rim. Table 5 illustrates the employment portrait of the travel and tourism cluster within Niagara County in 2009. Employment opportunities in the travel and tourism cluster represent only some of the potential economic benefits of increased tourism. Additional economic impacts related to travel and tourism are discussed in further detail in subsection

Table 5: Niagara County's Travel & Tourism Cluster, 2009

Travel & Tourism: All Industry Groups					Accommodations		Culture, Recreation and Amusements		Food Service		Passenger Transportation		Travel Retail	
Jobs	"Total Wages ($ mn)"	"Average Wage"	"% Share of Total Jobs in County"	"% Share of Wages in County"	Jobs	"Total Wages ($ mn)"	Jobs	"Total Wages ($ mn)"	Jobs	"Total Wages ($ mn)"	Jobs	"Total Wages ($ mn)"	Jobs	"Total Wages ($ mn)"
5,110	$126.2	$24,700	7.3	5.1	740	$12.8	2,640	$78.6	1,010	$12.2	440	$15.9	280	$6.6

Source: NYSDOL, 2011 (preliminary data)

B(3), below.

2. Increased Property Values

According to TPL, two key factors influence how the values of residential land change due to their proximity to open space and parkland: 1) the distance or "nearness" to the space and how well they are physically connected, and 2) the quality of the open space, including how well it is maintained. Anecdotal evidence from metropolitan Dallas supports the notion of valuable connectivity; builders there noted a 25% premium on projects adjacent to the Katy Trail system (RTC, 2007). The value of nearness was experienced in the City of Denver, where TPL's research concluded that the value of residential properties within 500 feet from a park increased by 5%. In Denver's case, this added $724 million to the city's tax base and generated $4.08 million in additional property tax revenue (TPL, 2010). A TPL study in Philadelphia documented the same effect, and estimated a total increase of $688.8 million in property values due to the presence of nearby parks. This generated $18.1 million in additional property taxes (Gies, 2009). In another study in Washington DC, using the same 5% impact figure, $6,953,377 of additional property tax revenue was attributed to the increased value of residential property located within 500 feet of parks (Harnik and Belle, 2009).

A research study evaluating the impacts of a 50-acre "natural park" area on adjacent properties concluded that the increased value of residential properties could be 5% to 20% depending on their proximity. Here, based on home values of $210,000 to $240,000 and a property tax rate of 2% of the homes' values, nearby parkland generated an aggregate incremental property tax payment of $196,000 from 140 homes (TPL, 2010).

For commercial properties, the effects are similar. For example, commercial land along the Rose Kennedy Greenway abutting Boston's Big Dig project showed a value increase of 79% between 1988 and 2003. This was about double the increase in value of all assessed commercial properties in the city during the same period (Gies, 2009).

Although it is difficult to draw direct corollaries to the experiences of larger cities, these cases can serve as illustrative examples of the potential impact of ecological restoration on properties adjacent to the RMP. Because several state parks already exist within the RMP study area, the situation may not be completely analogous. However, considering the condition of some of those parks, and their fragmentation from one another and the community caused by the RMP, it is rational to assume that improvements associated with full removal and ecological restoration would have a similarly positive impact on adjacent property values. As of 2010, the full assessment value of residential properties within 500 feet of the RMP was approximately $46.6 million. A conservative 3% increase in residential property value as a result of their proximity to a restored, reconnected, and revitalized gorge rim would add an additional $1.4 million to the local tax bases of Niagara Falls and Lewiston. A full 5% increase in residential property values, consistent with the documented experiences of other cities as described above, would add an additional $2.3 million to the local tax base.

3. Increased Tourism/Ecotourism

As discussed in Part I, the tourism industry is one of the primary contributors to the regional economy, and the restoration of the gorge rim would present an opportunity for growth in the ecotourism sub-sector. As previously stated, ecotourism includes nature-oriented travel experiences and activities such as

birding, photography, hiking, kayaking, climbing, and biking. Although typically associated with tourism operations in developing countries, this opportunity could represent a new model for sustainable, nature-based ecotourism in an urban context. Ecotourism in the Niagara region may begin with the use of public parks or other natural areas, but its overall impact may be experienced in many different parts of the economy.

To illustrate this point, a TPL study looking at new spending from out-of-town visitors to Denver found that, of the 13.5 million out-of-town visitors in 2008, approximately 5.25% came because of the City's parks. A certain percentage of these stayed overnight at hotels, and others with friends and families. Using average spending figures from lodging, food, and incidentals, the study estimated that overnight visitors spent $33.08 million, visitors staying with friends and family spent $11.98 million, and day visitors spent $6.345 million. Using local sales and lodging tax figures, the study concluded that park-based tourism generated $3,048,860 in revenue for the City of Denver (TPL, 2010).

A similar study of the economic value of San Diego's parks was conducted in 2006. The San Diego Convention and Visitors Bureau estimated that 20% of tourists visited a park and that 22% of these visitors came to San Diego primarily because of its parks. It concluded that just under 5% of San Diego tourism was attributable to the city's parks, which were visited by 835,000 overnighters and 522,000 day visitors. Based on sales, meal and lodging taxes, the study concluded that these park visitors generated $8,579,000 in revenue to the city (Harnik and Belle, 2009).

The local and regional economic impact of parks and trails tourism is positive and well-established. Within the Niagara Frontier region, non-local visitors to state parks were estimated to have supported between 2,000 and 4,200 jobs from 2007 to 2008 alone. These positions generated between $75 and $154 million in employment income (Heintz et al., 2009). The positive impact of parks and trails tourism is evident in case studies from around the country:

- The development of the Mineral Belt Trail in Leadville (CO) contributed to a 19% increase in local sales tax revenues. Many business owners within the Town of Leadville noted that many of their customers were drawn to the area specifically because of the Mineral Belt Trail (Nadel, 2005).
- The Allegheny Trail in Allegheny County (PA) was credited with the development of ten new businesses in two towns along the length of the trail. Within the first five years following the creation of the trail, visitors from outside of the area were estimated to have spent an additional $3.2 million in the local economy as a direct result of the trail (Nadel, 2005).
- The Burlington Bikeway and Island Trail along the shoreline of Burlington (VT) was estimated to bring between $1 and $2.5 million into the local economy from non-local trail users in just five months of operation, from May to September, 2008 (Zhang et al., 2010).
- The total economic impact of tourists' expenditures related to use of the Virginia Creeper Trail in southwest Virginia has been estimated at approximately $1.6 million annually (Gill, 2001).
- Non-local users of parks, trails, and open space lands in Jefferson County (WI) have been estimated to spend approximately $15 million per year in the local economy. This spending supports approximately 420 jobs throughout the county, with an estimated total employee income of $6.2 million (Carleyolsen et al., 2005).
- Prior to its renovation, the Walkway Over the Hudson, a repurposed, pedestrianized railroad bridge in Poughkeepsie (NY) was anticipated to attract 267,000 total annual visitors (including 110,000 non-local visitors), and to generate $14.6 million in direct spending. In its first year of

operation, total visitation was estimated at 780,000, nearly three times the anticipated volume (Walkway Over the Hudson, 2011).

Recent overall visitation to Niagara Falls has been estimated at approximately 12 million travelers per year (NTCC, 2011). A previous analysis found that 9% of visitors to the Greater Niagara area participated in activities at public parks, and 6% participated in activities focused on nature (ERA, 2004). Using the estimated per person daily expenditures of $83.50 (ERA, 2004), if just 5% of the tourists visiting public parks were to extend their stay by one night as a result of the amenities offered by the restored Niagara gorge rim, the resulting additional trip expenditures would be $4.5 million. If 10% of these tourists extended their stay, the additional trip expenditures would be slightly more than $9 million. These revenues may be distributed through a number of economic channels, including hospitality services, retail businesses, and transportation services (Nadel, 2005).

Tourism industry studies show that ecotourists prefer multi-activity travel experiences, with a strong stated preference for walking, hiking, backpacking, and water-related activities (Wight, 1996b). Restoration of the Niagara gorge rim would open ecotourism-related opportunities for businesses and organizations to cater to these preferences, such as guide services, nature interpretation centers, or bicycle rental/sales/service providers. In addition, it would strengthen opportunities for programmatic connections with other ecotourism outlets throughout the region, as well as the many scenic and cultural parks located nearby. These include, but are not limited to:

- Tonawanda Wildlife Management Area
- Iroquois National Wildlife Refuge
- Tifft Nature Preserve
- Buckhorn Island Bird Conservation Area
- East River Marsh
- Gulf Wilderness Park
- Hyde Park
- Old Fort Niagara
- Erie Canalway Trail

Programmatic connections between these operations could include such cooperative ventures as joint marketing efforts or special event planning. Other local opportunities could be available in the nascent sustainable hospitality sub-sector, including LEED-certified bed and breakfasts or hotels, locally-sourced dining options, etc. (Levy and Duverger, 2010).

4. Increased Park Use

A study conducted for TPL in 2008 looked at how attendance numbers in city parks changed after eliminating automobile traffic. It concluded that, in many case, closing parks to vehicles dramatically increased park usage. As noted by the authors, "while automobiles bring people to parks, they also push them away." A study of Golden Gate Park in San Francisco in 2006 showed a 116% increase in park visitors on Sundays when the John F. Kennedy Drive is closed to cars, as compared to visitation on Saturdays when the road is open. This same study looked at San Antonio and the effect of banning cars on a one mile stretch of roadway in Brackenridge Park. The San Antonio Parks and Recreation Department indicated it saw a dramatic increase in usage when vehicular use was eliminated (Harnik and Belle, 2008).

While it is difficult to draw a direct corollary to attendance at Whirlpool and Devil's Hole State Parks, one can assume that attendance is negatively influenced to some degree by the presence of two lanes of traffic travelling at 45 miles per hour through or directly adjacent to the parks. NYSOPRHP estimated that a total of 352,764 people visited these two parks in 2010 (NYSOPRHP, 2011); even a modest annual increase of 10% would bring more than 35,000 additional visitors to use these parks. In addition, although the Restoration Concept proposed in this study would greatly reduce the overall footprint of cars throughout the park area, it would still allow for vehicular access to Whirlpool and Devil's Hole State Parks, so that current users would not be inconvenienced.

This increased visitation would have direct and tangible benefits to the local economy. When users of the Schuylkill River Trail in southeastern Pennsylvania were asked how the trail had influenced their personal spending, 78% of respondents indicated that they had purchased "hard goods" (such as bicycles, accessories, or clothing) because of their use of the trail. The average expenditure on these goods was valued at approximately $400. In addition, 50% of users indicated that they had spent an average of $9 per park visit on "soft goods" (such as food and drinks) (RTC, 2009).

5. Health Value

Some of TPL's work tried to quantify the health value of parks. In these studies, it is assumed that greater physical exercise will increase health and reduce certain medical problems (e.g. heart disease and diabetes) and their attendant costs. Using a "health benefits calculator," assigned cost differentials were calculated for those who exercise regularly and for those who do not, by age; these differentials were estimated at $351 for persons under 65 years old and $701 for persons over 65. In Denver, one study estimated that 171,363 persons exercised actively enough in parks to reduce their health costs. Using these assumptions, it concluded that a combined health savings of $64,955,500 was attributed to park use (TPL, 2010).

6. Quality of Life

In the competitive world of economic development, a community's amenities, such as parks and conservation areas, can be powerful tools to attract and retain businesses and quality employees. Richard Florida's book, *The Rise of the Creative Class* (2002), indicates that today's business leaders recognize that a good environment is ranked as the most important amenity in successfully attracting high technology workers. Many communities have recognized the importance of their quality greenspace in developing revitalization strategies to attract and retain businesses. According to a publication of the American Planning Association, "knowledge" workers are attracted to cities such as Seattle, Portland, San Francisco, Denver, and Austin which have quality open space and associated amenities, such as accessible outdoor recreation, hiking and biking trails, etc. (APA, 2002).

7. Traffic Benefits

As discussed in Part II of this study, with full closure of the RMP, the potential inconvenience to motorists who use this road would be a few extra minutes in travel time. There are several north/south roadways with excess capacity, which can be used as alternatives to the RMP. Because motorists have several choices, they will not all be drawn to a single roadway by default. Additionally, due to the very nature of RMP as a limited-access parkway which legally only accommodates noncommercial traffic, commercial traffic is already using routes other than the RMP. Therefore, closure of the parkway will not divert larger

commercial vehicles onto roadways through residential neighborhoods. Traffic from the RMP is anticipated to be dispersed across the existing road network, including Route 104/Lewiston Road, Highland Avenue, and Hyde Park Avenue. The percentage of distribution of vehicles onto each roadway would be difficult to predict. However, even if 100% of vehicles elect to use Route 104/Lewiston, the actual number of cars that may use this roadway would be relatively low and would not cause traffic on Route 104 to exceed capacity (see Appendix D).

While closure of the RMP would result in little, if any, noticeable impact on commuting times or traffic congestion, it will, on the other hand, remove vehicular activity from the gorge rim, thus enhancing safe public access to and appreciation of the Niagara gorge and rim. The traffic that becomes redirected through the City of Niagara Falls, although limited, would present potential customers and possible economic benefits to local businesses. In addition, the Restoration Concept includes streetscape improvements along local streets throughout the area, including Third Street, Pine Avenue, Cedar Avenue, Whirlpool Street, Willow Avenue, and Ontario Avenue in Niagara Falls, and South Fourth Street in Lewiston. Such improvements at key junctures along the park/urban interface will further enhance local property values, serve as important elements of local wayfinding, and strengthen adjacent neighborhoods' sense of place.

3. Restoration Concept Summary

There is no question that the Niagara gorge rim once served the region as an important, and at times critical, transportation route. Indeed, the history of the rim and the settlements that arose along its length provides ample evidence that the growth and prosperity of Niagara Falls have, at one time, benefited from such a use. However, the examination presented in this study should compel residents and regional decision-makers to reconsider whether these historic benefits remain valuable in a contemporary setting, where economic, environmental, and cultural patterns are dramatically different than they were when the RMP was constructed. While the RMP may still provide easy (albeit redundant) access between Lewiston and downtown Niagara Falls, this benefit is only experienced by the few drivers that actually utilize the roadway. In contrast, the disadvantages of a degraded environment, foregone economic opportunities, and a disconnected waterfront are experienced by the entire region.

As the community and its elected decision-makers weigh the merits of options for resolving those disadvantages, the option of full roadway removal and ecological restoration, as described in this Restoration Concept, should be considered as that which offers the most valuable benefits to every constituent within the region. This concept presents the greatest potential for substantial and quantifiable public benefits to the regional economy and environment. It will contribute to the revitalization of the area in a way that no roadway can, by improving the quality of the air and water, contributing to regional biodiversity, and inviting residents to reconnect with their waterfront, all while opening opportunities for economic development.

The Restoration Concept is graphically described throughout the illustrations that follow (Figure 3). The Index Sheet (Figure 3.0) provides an overview of the Restoration Concept throughout the entire Study Area. The subsequent figure sheets (Figures 3.1-3.6 from north to south, respectively) each describe a portion of the concept in further detail, demonstrating the potential location of the Niagara Rim Trail, cultural uses, restored meadows and woodlands, and streetscape enhancements. Landmarks are identified for the purpose of orientation.

Niagara Gorge Rim Restoration Concept

INDEX SHEET

edr COMPANIES

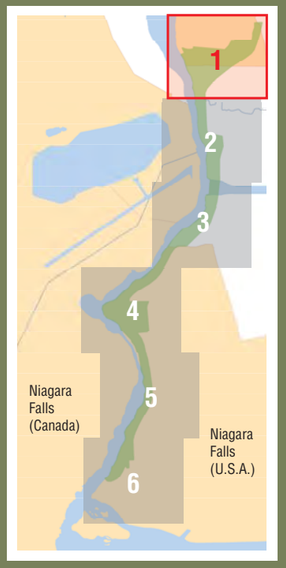
Figure
3.0

Figure 3.1
Restoration Concept

Lewiston Plateau/Earl W. Brydges Artpark

Sheet 1 of 6

edr COMPANIES



Legend: Restoration Concept

- Lawn
- Meadow
- Woodland
- Existing Buildings
- Proposed Buildings
- Niagara Rim Trail / Multi-use Trail
- Existing Trail
- Driveway / Road / Parking Lot
- Streetscape Enhancements

NORTH

Figure 3.1

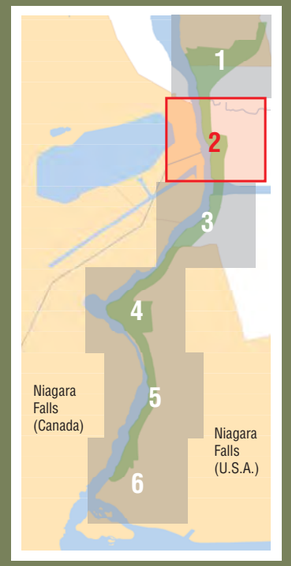
Regional Economic Growth Through Ecological Restoration of the Niagara Gorge Rim

Figure 3.2
Restoration Concept

Niagara Escarpment-Country Club to Robert Moses Niagara Power Plant

Sheet 2 of 6

edr COMPANIES



Legend: Restoration Concept

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- Meadow
- Woodland
- Existing Buildings
- Proposed Buildings
- Niagara Rim Trail / Multi-use Trail
- Existing Trail
- Driveway / Road / Parking Lot
- Streetscape Enhancements
- Illustrative View of Niagara Rim Trail See page 57

NORTH

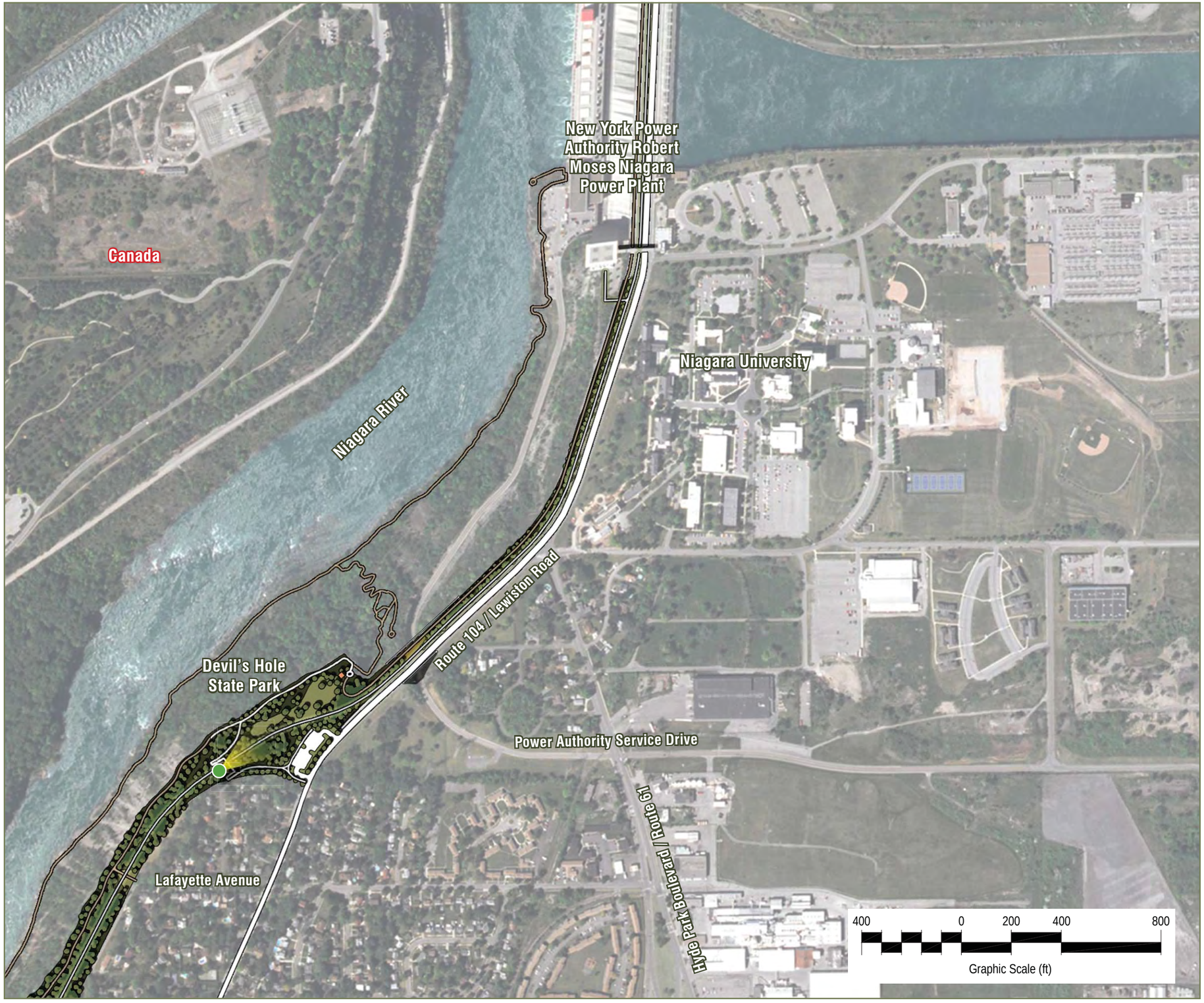
Figure 3.2

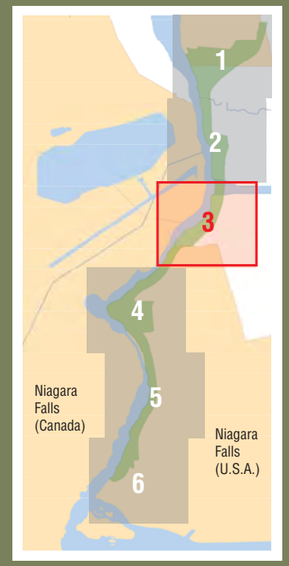
Figure 3.3
Restoration Concept

Devil's Hole State Park/Power Vista

Sheet 3 of 6

edr COMPANIES





Legend: Restoration Concept

- Lawn
- Meadow
- Woodland
- Existing Buildings
- Proposed Buildings
- Niagara Rim Trail / Multi-use Trail
- Existing Trail
- Driveway / Road / Parking Lot
- Streetscape Enhancements
- Illustrative View of Niagara Rim Trail See page 58

NORTH

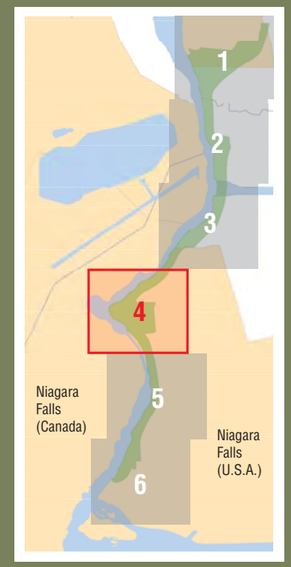
Figure 3.3

Figure 3.4
Restoration Concept

Whirlpool/DeVeaux Woods State Parks

Sheet 4 of 6

edr COMPANIES



Legend: Restoration Concept

- Lawn
- Meadow
- Woodland
- Existing Buildings
- Proposed Buildings
- Niagara Rim Trail / Multi-use Trail
- Existing Trail
- Driveway / Road / Parking Lot
- Streetscape Enhancements
- Illustrative View of Niagara Rim Trail See pages 60 and 61

NORTH

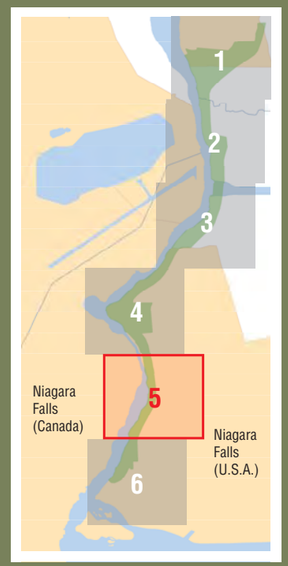
Figure 3.4

Figure 3.5
Restoration Concept

Elevated Niagara Rim Trail

Sheet 5 of 6

edr COMPANIES



Legend: Restoration Concept

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- Woodland
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- Proposed Buildings
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- Existing Trail
- Driveway / Road / Parking Lot
- Streetscape Enhancements
- Illustrative View of Niagara Rim Trail See pages 62 and 63

NORTH

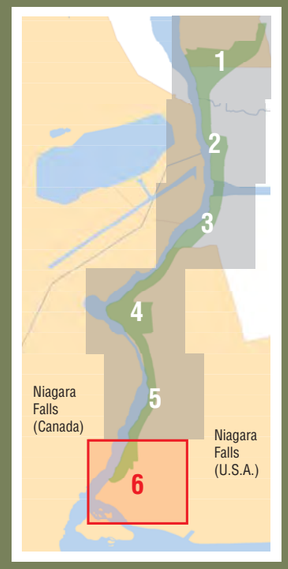
Figure 3.5

Figure 3.6
Restoration Concept

***Proposed Aquarium of Niagara Falls & Niagara Gorge Discovery Center**

Sheet 6 of 6

edr COMPANIES



Legend: Restoration Concept

- Lawn
- Meadow
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- Proposed Buildings
- Niagara Rim Trail / Multi-use Trail
- Existing Trail
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- Illustrative View of Niagara Rim Trail See page 67

NORTH

Figure 3.6