



Indiana LTAP



Best Practices in Trail Maintenance

A Manual by the Ohio River Greenway

Best Practices in Trail Maintenance

A Manual by the Ohio River Greenway

November 2014

INDIANA LTAP CENTER
Purdue University Civil Engineering
3000 Kent Ave. Ste. C2-118
West Lafayette, Indiana 47906

Telephone: (765) 494-2164
Toll Free in Indiana: (800) 428-7639
Facsimile: (765) 496-1176

This document is disseminated under the sponsorship of the Indiana LTAP Center at Purdue University in the interest of information exchange. Purdue University and the Indiana LTAP Center assume no liability for its contents or use thereof. Purdue University and the Indiana LTAP Center do not endorse products or manufacturers. Trademarks or manufacturers names may appear herein only because they are considered essential to the objective of this document. The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official policy of Purdue University or the Indiana LTAP Center. This report does not constitute a standard, specification, or regulation.

This manual is intended for practical use by trail maintenance managers, and particularly those working along the Ohio River Greenway and in similar environs. It will also be useful for policy makers who are tasked with anticipating and planning for maintenance budget and personnel needs.

Table of Contents

List of Tables	6
List of Figures.....	6
Acknowledgements.....	7
Abstract.....	8
Section 1: Overview/Background	9
1.1 Trail Maintenance: Trends, Standards, and Practices	9
1.2 The Ohio River Greenway: History	11
1.3 Ohio River Greenway: Current Maintenance Practices & Anticipated Needs	13
Section 2: Tools for Creating and Implementing a Maintenance Plan.....	14
2.1 Anticipating Maintenance Costs.....	14
2.2 Technologies for Asset Management.....	16
2.3 Considerations for Selecting Contractors	17
2.4 Prioritizing Maintenance Needs.....	17
Section 3: Quick Reference Maintenance Solutions	18
3.1 Traffic Control Devices: Signage and Markings.....	18
3.2 Trash Removal and Sweeping.....	18
3.3 Vegetation / Erosion	19
3.4 Graffiti	19
3.5 Bridges	19
3.6 Pavement.....	22
3.7 Seasonal Issues.....	25
References.....	26
Appendix A: Ohio River Greenway Commission	29
Appendix B: Additional Resources.....	30
Appendix C: Assets Inventory	32
Appendix D: Bloomington, IN, Parks and Recreations Graffiti Removal and Prevention Program	33
Appendix E: Bloomington, IN, Sample Construction Contract Agreement	35

List of Tables

Table 1. Milwaukee Construction Cost-Per-Mile Estimates	10
Table 2. Assorted Maintenance Cost Estimates	10
Table 3. National, State, and Industry Standards	11
Table 4. Current Practices	13
Table 5. St. John’s County Greenway Maintenance 2003 Cost Estimates	15
Table 6. City of Bloomington Contract Excerpts	17
Table 7. Estimated Extended Life (years) for Preservation Surface Treatments for Asphalt Pavements.....	17
Table 8. Sources of “Check Lists” for Asphalt Pavement Maintenance and Preservation Construction.....	23
Table 9. PCC-Surfaced Trail Maintenance Recommendations	23
Table 10. INDOT Standard Materials for Seal Applications.....	24
Table A1. ORGC Advisory Committees	29
Table A2. Members of the Ohio River Greenway Commission, October 2014.....	29
Table C1. Template for Taking an Inventory of Ohio River Greenway Assets.....	32

List of Figures

Figure 1. Map of the Ohio River Greenway.....	12
Figure 2. Ohio River Greenway Features Inventory, Made with GISCloud Software.....	16
Figure 3. Cost Effectiveness of Treatments	22
Figure 4. Typical Treatments Tied to PASER Ratings	22

Acknowledgements

Thank you to the contributors and sponsors who helped to make this manual possible.

Advisory and Technical Support

Indiana LTAP, Technical Advisory Group

M. Dudley Bonte, P.E. - Technical Director, Asphalt Pavement Association of Indiana (APAI)

Patrick Conner, P.E. - Research Manager, Indiana LTAP, Purdue University

Patrick Long - Director of Marketing and Government Affairs, American Concrete Pavement Association (ACPA), Indiana Chapter

Dave Williams - Operations and Development Director, City of Bloomington Parks and Recreation Department

Ohio River Greenway Commission and Staff

Shaunna Graf – Project Director, Ohio River Greenway Commission; Supervisor

Meredith Gainer – Administrative Assistant, Ohio River Greenway Commission

Writing and Design

Isabella Christensen – Intern to the Ohio River Greenway Commission

Funding Sponsors

Indiana LTAP (Local Technical Assistance Program)

Production and Publication

Indiana LTAP

Purdue University e-Pubs

Other Contributors

Christopher Gardner – Director, New Albany Flood Control

Brian Kaluzny – Superintendent, Clarksville Department of Parks and Recreation

Kelly Phillips – Director, Neighborhood and Business Development;

Executive Director, Jeffersonville Urban Enterprise

Scott Wood - Director, Plan Commission, New Albany Planning & Zoning

American Concrete Pavement Association (ACPA), Indiana Chapter

Asphalt Pavement Association of Indiana (APAI)

City of Bloomington, Indiana

Abstract

This manual is intended for practical use by trail maintenance managers. It will also be useful for policy makers who are tasked with anticipating and planning for maintenance budget and personnel needs. The recommendations included in this manual were chosen, in part, to facilitate widespread adoption by other trail operators. They are cost-effective solutions that require minimal technological or financial commitments.

This manual does not provide guidance for trail construction and design, except where a maintenance issue can best be resolved by constructing new trail segments. For best practices in design and construction, consult the thorough list of resources provided on the Recreational Trails Program page of the Federal Highway Administration website.¹

The contents of this manual reflect the views of the author, who is solely responsible for the accuracy of the data presented. This manual does not constitute or supersede standards, specifications, or regulations, and does not establish a legal standard of care for users.

Keywords: best practices, maintenance, trail, greenway, Indiana, assets

¹ Federal Highway Administration. (2014). Recreational Trails Program.
http://www.fhwa.dot.gov/environment/recreational_trails/guidance/manuals.cfm

Section 1: Overview/Background

1.1 Trail Maintenance: Trends, Standards, and Practices

A national push for the construction of new bicycle and pedestrian facilities began in the early 1990s. The results were notable: an 80-fold increase in new construction spending (between 1988 and 2002), the designation through the White House Millennium Initiative of more than 2,000 local, shared-use Millennium Trails, and close to 5,000 state-driven trails projects in progress in 2002.² In Indiana, this movement has created “more than 3,268 miles of trails and bikeways open for public use across the state,” nearly meeting the goal set by the Indiana Department of Natural Resources of “having a trail within 7.5 miles (or 15 minutes) of all Indiana residents by 2016” in July, 2013.³

The explosion of multi-use paths brings increased health and recreational opportunities for users, and new planning challenges for trail managers. While the majority of Indiana’s trails have been built with a mix of state and federal funding, the funding options for non-construction activities are comparatively few: in addition to the RTP (Recreational Trails Program), the FHWA lists only the “STP (including the enhancement set-aside), the Highway Safety Improvement Program, and the CMAQ Program (23 U.S.C. 217(a)). State and Community Highway Safety Grant Program funds (Section 402) are to be used exclusively for nonconstruction activities.”⁴ Additionally, it is far easier to find technical support for design and construction matters than for maintenance concerns. This manual, sponsored by the Indiana Local Technical Assistance Program, is a first response to this deficit of information.

Deferred trail maintenance is a nationwide issue. As our leading expert in parks and preservation services, the National Park Service, approaches its 100-year anniversary in 2016, it faces a multi-billion dollar backlog of deferred maintenance.⁵ The problem of securing funding for maintenance is not unique to trails: Smart Growth America states that, between 2009 and 2011, annual state spending on expanding and constructing roadways (accounting for 1% of the total state-owned road network) was at \$20.4 billion, while annual state spending on maintenance and preservation (caring for the other 99% of the network) stood at only \$16.5 billion.⁶ Such spending priorities do not reflect that nearly a quarter (21%) of the national road network was rated in poor condition in 2011.

In 2011, INDOT estimated the cost-per-mile of constructing new separate-alignment, shared-use paths at \$775,000, and the cost-per-mile of building out and maintaining an existing separate-alignment, shared-use path at \$115,000.⁷

² Center for Environmental Excellence, p. 48

³ INDOT, Bicycle and Pedestrian Program

⁴ INDOT, Bicycle and Pedestrian Program; FHWA, Bicycle & Pedestrian Program

⁵ Clementino, *Deferred Maintenance*

⁶ Smart Growth America, *Repair Priorities 2014*

⁷ INDOT, Indiana Safe Routes to School Program. This is no longer a standalone program, so these figures could not be investigated; however, these are the most recently available figures available from the state, and are thus included herein.

Indiana Local Technical Assistance Program

Table 1. Milwaukee Construction Cost-Per-Mile Estimates

Segment/Trail	Description	Cost-per-mile
Honey Creek Parkway	bike trail from Portland Ave to 70th St, not including bridge construction	\$149,206 per mile for 10 foot wide asphalt trail
Root River	from 60th St. under Hwy 100 to Rainbow Airport, not including boardwalk	\$301,014 per mile for 10 foot wide asphalt trail
South Side Trail (a.k.a. Kinnickinnic River Bicycle Trail)	base construction including trail amenities, signage, and drainage issues	\$176,470 per mile for a 10 foot wide asphalt trail
Hank Aaron State Trail (West Allis Line)	6.5 miles, including retrofit of bridges	\$224,307 per mile for a 10 foot wide asphalt trail

Source: Milwaukee County Dept. of Parks, Recreation, and Culture
<http://www.americantrails.org/resources/ManageMaintain/MilwMaintcost.html>

A comparison of the cost estimates for construction in Milwaukee (Table 1, above) and an assortment of cost estimates for maintenance services (Table 2, below) likewise demonstrate that construction is much more costly than routine maintenance.

Table 2. Assorted Maintenance Cost Estimates

Source	Trail	Cost-per-mile
provided in the Iowa Trails 2000 plan by the Iowa Department of Transportation	a mixture of different surfaces	\$1,500 per mile
Milwaukee County Park System	all asphalt paths	\$2,525 per mile
Rail Trail Maintenance & Operation Manual provided by the Rails-to-Trails Conservancy		\$1,200 per mile (absolute minimum)
for government run trails in the Rail Trail Maintenance & Operation Manual provided by the Rails-to-Trails Conservancy		\$2,077 per mile
in the Trail Cost Model - Draft by the Wisconsin Department of Natural Resources	unpaved trail	\$2,042.06 per mile

Source: Milwaukee County Dept. of Parks, Recreation, and Culture
<http://www.americantrails.org/resources/ManageMaintain/MilwMaintcost.html>

Despite the difficulties with comparing collected cost data, which is compiled by different agencies on varying criteria, it is clear that initial construction costs dwarf the costs of routine maintenance and enhancement of existing facilities; however, as this manual will stress, deferring maintenance can dramatically increase maintenance costs and invert that cost balance. Unfortunately, deferment is common since funding for routine maintenance has been comparatively difficult to secure. As trails age without appropriate maintenance, opportunities for substantial cost-savings through early intervention shrink. Despite a present lack of funding and technical support, local trail managers are obligated to maintain federally-funded trailways in accordance with standards for public safety and access rights (see Table 1). In addition to compiling a menu of best practices for managers' reference, this document highlights the important role of maintenance to the longevity of trail systems.

Table 3. National, State, and Industry Standards

Indiana Department of Transportation – 2013 Design Manual. Chapter 51 – Special Design Elements.	http://www.in.gov/indot/design_manual/files/Ch51_2013.pdf
ADA.gov. Information and Technical Assistance on the Americans with Disabilities Act	http://www.ada.gov/ada_req_ta.htm
The American Association of State Highway and Transportation Officials. Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2010 (AASHTO Pedestrian Guide)	http://www.railstotrails.org/resources/documents/ourWork/trailBuilding/DraftBikeGuideFeb2010.pdf
The American Association of State Highway and Transportation Officials. Guide for the Development of Bicycle Facilities, 1999 (AASHTO Bike Guide)	http://www.fhwa.dot.gov/environment/recreational_trails/guidance/manuals.cfm#aashto
Federal Highway Administration. Program Guidance.	http://www.fhwa.dot.gov/environment/recreational_trails/guidance/manuals.cfm#links
Federal Highway Administration. A Guide for Maintaining Pedestrian Facilities for Enhanced Safety.	http://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwas13037/

1.2 The Ohio River Greenway: History

The Ohio River Greenway is a paved, multi-use, urban, linear recreational trail in Southern Indiana that roughly follows the course of the Ohio River. When it is completed in 2015, the 7-mile trail will pass through the Southern Indiana cities of Jeffersonville and New Albany and the town of Clarksville, and, with the 2014 opening of the Big4 Pedestrian Bridge, spans the Ohio River to link Jeffersonville to Louisville, KY.

The purpose of the Greenway is to increase connectivity between the three riparian localities, between their residents and the natural resources and services provided by the Ohio River, and between the cities on either side of the Ohio River. The design of the Ohio River Greenway provides recreational opportunities, a contiguous alternative transportation option between municipalities, natural resource protection, opportunities for cultural and educational learning, a local economy stimulus, and health and wellness activities.

Governance of the Greenway is complicated, as the trail falls within three local governmental jurisdictions – the cities of New Albany and Jeffersonville, and the town of Clarksville – which, in turn, are within the boundaries of Floyd and Clark counties. Additionally, the Greenway intersects with lands that belongs to a state (Falls of the Ohio State Park), and lands that are managed by the U.S. Army Corps of Engineers, a federal agency. Each of these entities observes a distinct set of rules related to funding sources and management procedures, which were partially spelled out in the June 2003 Project Cooperation Agreement between the Department of the Army (Corps of Engineers) and the non-Federal sponsors (Ohio River Greenway Development Commission, City of New Albany, Town of Clarksville, and the City of Jeffersonville).

Indiana Local Technical Assistance Program

The Ohio River Greenway Commission was created in 1993 to facilitate the collaborative governance of the Greenway, and to serve as a non-profit, quasi-governmental channel for funding and other resources. The genesis of the Ohio River Greenway Commission was a charter by the Indiana Legislature in April 1993, which created the Ohio River Greenway Development Commission and granted it the power to coordinate, recommend, and implement Ohio River Greenway activities.

The Commission is comprised of three persons from each of the three local governments – the Chief Executive (Mayor or Town Council President) of each locality and that Chief Executive’s two citizen appointees – as well as representatives from Clark and Floyd Counties who are appointed by the Governor for four year terms. Non-voting members that lend support to the Commission include the Director of the Office of Tourism, the Director of the Indiana Department of Natural Resources, the Commissioner of the Indiana Department of Transportation, and the President of the Indiana Economic Development Corporation. Appointed and non-voting members of the Commission are volunteers (Ohio River Greenway Commission, 2014). The present organization and membership of the ORGC, including its standing committees, are shown in Appendix A.

In 2007, the Commission added an employee, a project manager, and in 2013, it hired a part-time administrative assistant. Also in 2013, realizing the pressing need for a maintenance policy and manual to coordinate maintenance of the completed portions of the greenway, the Commission applied for and was awarded a grant through the Indiana Local Technical Assistance Program (LTAP) to research and develop a trailway maintenance manual.

Figure 1. Map of the Ohio River Greenway



Source: Ohio River Greenway, <http://www.ohiorivergreenway.org>

1.3 Ohio River Greenway: Current Maintenance Practices & Anticipated Needs

The first step to creating a maintenance program is to understand current and anticipated needs and assess the local capacity to meet them. Currently, maintenance of the Ohio River Greenway is handled by various departments within each of the three communities. The table below summarizes the current approach to maintenance. This information was gathered through interviews with officials from the three Ohio River Greenway communities.

Table 4. Current Practices

	Clarksville Parks & Recreation	New Albany Flood Control District	Jeffersonville Parks and Recreation	Jeffersonville Redevelopment
Mowing	Y	Y	Y (Contract Out)	
Edging	Y	Y	Y (Contract Out)	
Landscaping	Y	Y	Y (Contract Out)	
Trash/Debris Removal	Y	Y	Y	
Graffiti Removal	Y	Y	Y	
Signage	N	Y		Y
Gate & Fencing	-	Y		Y
Lighting	Y (Contract Out)	Y		Y
Drainage & Riprap Areas	Not Yet	Y	N	N
Benches	Y	Y		Y
Picnic Tables	Y	Y		Y
Garbage Cans	Y	Y	Y	Y
Play Structures	-	Y	-	-
Flagpoles	Y	Y		Y
Docks	-	Y		Y
Seasonal Care (i.e. snow removal, flooding, etc.)	N	Y	N	N
Other				

The interviews revealed common concerns. For example, none of the communities currently uses a mobile application to capture trail user concerns, although there is expressed interest in doing so in the future. Many robust models exist currently: one well-designed example is the Louisville Mobile “suite” of apps, created by Ohio River neighbor Louisville, KY, which includes user feedback options for the 100-mile Louisville Loop multi-use path.⁸ Additionally, all three communities anticipate a range of repairs to the asphalt and concrete trailways and bridge decks in the near future, and are concerned with associated costs.

⁸ Net Tango, Louisville Mobile

Taking or updating an inventory of fixed assets is another important step in managing maintenance planning. The Ohio River Greenway inventory was created using GISCloud, a mapping software, to list and map its fixed assets. The major challenge in creating an inventory is to define its scope: determining the relevant distance from the trailway edge, whether to count trees and other natural features, whether and how to note the presence of above or below ground fiber optic and power lines, what trail uses are allowed, and so on. If the trail is in an urban setting, it might be useful to inventory trail crossings, noting elements such as crossing width and type, signage and pedestrian signals, and ADA accessibility for the ramp and grade.⁹ There are numerous, customizable inventory templates available online, and the Ohio River Greenway inventory template is included in Appendix C.

Section 2: Tools for Creating and Implementing a Maintenance Plan

2.1 Anticipating Maintenance Costs

Maintenance costs are highly variable. Geography, regional economy, exposure, allowed uses, frequency of vandalism, labor costs, and requirements of needed maintenance all play a role in determining the financial burden of trail maintenance.

LABOR: Many trails owners reduce labor costs by partnering with local nonprofit or volunteer advocacy groups, while others enjoy a dedicated budget or an active collaboration with an existing agency, such as a local parks and recreation department. In recent years, contracting out for major work has become increasingly common, as governmental hiring has slowed and budgets have contracted in recent years. Thus, in-house skills and resources of a trail management crew is a determining factor of the cost of maintenance.

Man hours required to complete annual maintenance tasks on the Schuylkill Trail in Montgomery County, PA, can be found on the AmericanTrails.org website: <http://www.americantrails.org/resources/ManageMaintain/SchuylMaint.html>

REGIONAL ECONOMY: Service and material costs vary widely between and even within regions. The Indiana Department of Transportation compiles a yearly summary of unit prices for all pay items included in the low, high, and average bids included in INDOT-awarded project contracts.¹⁰ (This document is accessible through <http://www.in.gov/dot/div/contracts/pay/>)

VANDALISM: Costs associated with acts of vandalism can be difficult to control; however, some design and maintenance practices can lower costs by discouraging vandalism. See, for example, preventive measures in Section 3.5: Graffiti.

MAINTENANCE PRACTICES: The degree to which routine preventive maintenance is practiced can greatly impact total costs, particularly by extending pavement life. See Figure 3.

EXPOSURE FACTORS: A trail's particular weather and traffic exposure factors are major determinants of total maintenance costs. For example, the cost data from St. John's County, Florida (see Table 5) does not necessarily apply to trails in regions that do not receive as much sun or where winter weather can affect pavement condition by the use of de-icing materials.

MAINTENANCE REQUIREMENTS AND GEOGRAPHY: Mobilization of a trail crew can be a major component of maintenance costs. Gaining access to trails to perform maintenance can be challenging and time-consuming. Engelmann writes that "maintaining trails entails different challenges than maintaining roads. For example, trails are narrow and may have been constructed with less sub-base support, so when heavy road maintenance equipment is used, that equipment may cause more damage than the repairs," and that consequently, many "contractors won't work on trails because their equipment is too heavy for trails or too large for narrow trail corridors."¹¹ Mobilization should therefore be a key component of contract negotiation. Solid pre-bid meetings should include checks on certifications and relevant experience, and discussion of a contractors' plan to sub-contract specialized jobs and gain access to the project area.

⁹ 11/07/2014, Personal email communication with Amy Hartzog and Dawn Ritchie.

¹⁰ INDOT, Pay Items

¹¹ Engelmann, "Preventive Maintenance"

Keeping variability in mind, the information in the following table might provide a useful baseline estimate. It should also provide incentive to practice preventive maintenance in order to delay and perhaps reduce costs of major reconstruction work.

Table 5. St. John’s County Greenway Maintenance 2003 Cost Estimates

Maintenance Task	Task Type	Recommended Frequency	Cost
Routine maintenance: <ul style="list-style-type: none"> • Yearly facility evaluation to determine the need for minor repairs • Tree/brush clearing • Mowing • Map/signage updates • Trash removal/litter clean-up • Repair flood damage: silt clean-up, culvert clean-out, etc. • Patching, minor regrading, or concrete panel replacement • Planting, pruning, and general beautification • Installation and removal of seasonal signage 	Routine	On-Going	\$1,500 Annually
Sealcoating for 6-foot pedestrian trail	Minor Repairs	Every 5 years	\$3,500 per mile
Sealcoating for 10-foot multi-use trail	Minor Repairs	Every 5 years	\$5,800 per mile
Amenity replacement	Minor Repairs	As needed	On par with original costs
Resurfacing for 6-foot pedestrian asphalt trail	Major Reconstruction	Every 10 years	\$7,920 per mile for 1-inch overlay
			\$15,840 per mile for 2-inch overlay
Resurfacing for 10-foot multi-use asphalt trail	Major Reconstruction	Every 10 years	\$13,200 per mile for 1-inch overlay
			\$26,400 per mile for 2-inch overlay
Complete replacement, regrading, resurfacing	Major Reconstruction	Every 20 years	On par with original costs

Source: http://www.sjcfcl.us/LAMP/media/SJC_GBT/trail_op_main_mgmt.pdf (pp 66-68)

St. John’s County recommends that “trail operators should maintain records of the general costs of trail amenities as a means of estimating future repair and replacement costs. If custom elements such as lighting, decorative railings, or benches are used in trail design, the trail owner should consider ordering extra elements at the time of construction and storing them for future use, thereby defraying the cost of single-runs later.”¹² However, experience along the Ohio River Greenway have shown that ordering supplies for anticipated future needs can be difficult when budgets are tight.

A best practice when purchasing new or replacement items is to procure items with the greatest life cycle cost and require the least amount of maintenance. Often these items may be more

¹² St. John’s County, p. 67

expensive up front, but can pay for themselves overtime. Factoring in such items during the planning phases, engineer estimates, and the grant proposal will help ensure getting the right assets incorporated at the right time, especially when funding is more likely to be available.

2.2 Technologies for Asset Management

An inventory of fixed assets on the Ohio River Greenway was created using GISCloud, a free, cloud-based software for collecting, mapping, and sharing geographical data. (GIS, which stands for Geographical Information Systems, is a standardized method of collecting and displaying geographic information.) While GISCloud is similar in function to well-known ArcGIS, it does not carry the cost of proprietary software, has a smoother learning curve, and allows for cloud-based, easily exportable data collection, representation, and sharing. Field data collection is accomplished using a mobile application (available for both Android and iOS) which shows the data fields that populate the spreadsheet. A GISCloud inventory can be used to facilitate maintenance functions ranging from the easy ordering of replacement bulbs to tracking real-time flooding or snow removal. An example of the early stages of this work is shown in the figure below; each dot represents an asset and corresponding data including location, condition, manufacturer, and maintenance jurisdiction.

Figure 2. Ohio River Greenway Features Inventory, Made with GISCloud Software



Source: Ohio River Greenway Inventory, 2014

GIS technology can be used to organize a variety of data and make it actionable. The PASER Cooperative Road Condition Survey Demonstration Project showed that “the combination of GIS, GPS and the PASER rating system is an excellent methodology for the rapid, accurate, and cost-effective collection of surface condition data...”¹³

Technology supporting the collecting of user-generated data is growing in popularity. Mobile applications that allow trail users to report concerns are a useful and increasingly common technology for gathering public safety data. Some of these applications are designed for city-wide concerns, while others are designed specifically for a trailway or parks system. While it is possible that allowing public reporting might obligate trail managers to respond to a number of uninformed complaints, user-supplied data can also increase information flows and response efficiency. Trail managers are obligated, legally and professionally, to prioritize maintenance issues wherever there are safety issues on a trail. Management of lighting, landscaping, debris, and pavement conditions is important for both public perception of trail security and actual public safety outcomes.

¹³ Domonkos, PASER, p. 4

2.3 Considerations for Selecting Contractors

Liability, relevant skills and certifications, and resources are the three major considerations for selecting a contractor. While trails that are built with federal funding automatically fall under INDOT, bonding and insurance is also paramount for quoting out smaller contracts. One useful reference for setting up a good contract is the standard contract used by the City of Bloomington (see Appendix E). Key provisions of this contract are summarized in Table 6.

Table 6. City of Bloomington Contract Excerpts

	Required by
The Contractor is prohibited from subletting or assigning any portion of the contract.	Section 4.03.02
The Contractor must carry minimum insurance coverages, as specified in the contract.	Sections 4.05.01 - 4.05.05
The Contractor is responsible for providing the state with any certification, authorization, license, permit or registration that is required by local, state or federal law.	Section 4.06
The Contractor certifies all construction, materials of construction, and design work for one year from date of completion.	Section 4.09
The Contractor indemnifies the City and bonds all work at 100% of the contract amount.	Sections 4.01 and 4.12
Contractor must use domestically-produced steel in accordance with Indiana Code 5-16-8	Section 4.17
Contracted services are defined in Attachment A, "Scope of Work."	Section 4.04

Source: City of Bloomington, Sample Construction Contract Agreement

2.4 Prioritizing Maintenance Needs

Life cycle estimates for fixed assets can be helpful for anticipating maintenance requirements. Although variable exposure to the elements (intensity of sun exposure, pooling water, etc) and to traffic loads can greatly impact outcomes, the ranges shown below can give an idea of average life of asphalt pavement preservation treatments.

Table 7. Estimated Extended Life (years) for Preservation Surface Treatments for Asphalt Pavements

Treatment Type	Existing Pavement Condition		
	Good	Fair	Poor
Crack filling/ sealing	3-4	2-3	0-2
Chip and seal	6-8	4-6	3-4
Fog seal	4-5	1-4	Not Recommended
Slurry Seal	6-7	3-6	2-4
Thin Overlay	6-17	5-10	2-4
Scrub Seal	4-6	4-6	1-4

Source: USDOT, FHWA <http://www.fhwa.dot.gov/preservation>

Section 3: Quick Reference Maintenance Solutions

Several best-practice timetables for railway maintenance tasks are readily available on the internet. One excellent online source for such a schedule is Table 16: Frequency of Common Maintenance Tasks, found in Appendix 2 of “Ensuring the Future of Your Trail – A Survey of 100 Rails-Trails.”¹⁴

3.1 Traffic Control Devices: Signage and Markings

Signage and roadway markings are a critical part of trail user experience, providing safety and information.

Purpose: Provide for trail safety and information.

Best Practices: The Federal Highway Administration has established the Peer-to-Peer Program (P2P) as a resource for public-sector agencies that need help navigating the MUTC.¹⁵

Notes: 2011 Indiana Manual on Uniform Traffic Control Devices (Revisions 1& 2). The MUTCD is the national standard under US 23 Code of Federal Regulations 655.603, and it applies to all roads (including bikeways) in Indiana:

“The responsibility for the design, placement, operation, maintenance, and uniformity of traffic control devices shall rest with the public agency or the official having jurisdiction, or, in the case of private roads open to public travel, with the private owner or private official having jurisdiction. 23 CFR 655.603 adopts the MUTCD as the national standard for all traffic control devices installed on any street, highway, bikeway, or private road open to public travel (see definition in Section 1A.13).

02 23 CFR 655.603 also states that traffic control devices on all streets, highways, bikeways, and private roads open to public travel in each State shall be in substantial conformance with standards issued or endorsed by the Federal Highway Administrator.”¹⁶

3.2 Trash Removal and Sweeping

There are two approaches to managing trash accumulation on a trailway. The most common method is to establish a program of ongoing trash removal and as-needed debris management. The other is to institute a “carry in / carry out” policy in which trash cans are not provided and the public is asked to remove any trash generated while on the trailway. Rural Brown County State Park has pursued carry in / carry out with success, while the urban Falls of the Ohio State Park abandoned a similar policy based on poor outcomes, finding better results with a mixed approach of providing trash receptacles and removal for its parking and picnic areas and a carry in / carry out policy for its paths and fossil beds. Regardless of the preferred approach, the goals of trash and debris removal policies are the same: to improve public health and safety and enhance trail user experience. The primary reasons for implementing a street sweeping program are air and water quality control, access and appearance, and maintenance clean-up.

Purpose: Protect public health and safety, improve air and water quality, and improve trail user experience.

Best Practices: Design guidelines and maintenance notes for hazardous materials planning and response can be found in *Indiana Design Manual*, Ch. 51, 51-10.0 Hazardous Materials.¹⁷

Reasons for sweeping and types of sweepers are among the topics covered in *Resource for Implementing a Street Sweeping Best Practice*. The information can be adapted for trails.¹⁸

¹⁴ Poole, *Ensuring the Future*, Appendix 2

¹⁵ USDOT & FHWA, *Manual on Uniform Traffic Control Devices*

¹⁶ INDOT, *2011 Indiana Manual*

¹⁷ INDOT, *2013 Design Manual*

¹⁸ Kuehl, *Resource for Implementing*

3.3 Vegetation / Erosion

Landscaping and erosion control are closely linked goals. Revegetation and planting in native vegetation can be particularly helpful in controlling erosion. Additionally, edging and weeding help maintain trail width, improve drainage, and prevent pavement heaving (i.e. pop-ups; see p. 31).¹⁹

Purpose: Control erosion, improve drainage, and protect trail width and surface.

Best Practices: Design guidelines and maintenance notes can be found in Indiana Design Manual, Ch. 51, Section 51-8.0 Landscaping.²⁰

The University of Minnesota's *Best Practices Handbook on Roadside Vegetation Management* covers best practices in vegetation selection and control, mowing policies, snow drift control, and public relations.²¹

Notes: Berms that build up along the trail edge and uphill slopes should be monitored for erosion onto trails.

Environmentally safe solutions should be used for weeding. The proximity of the Ohio River Greenway to the Ohio River and its tributaries means that runoff of herbicides cannot be avoided, so weeding must be done by hand. Similarly, the US Army Corps of Engineers prohibits the use of herbicide on the levee.

Planting in low-mow or no-mow vegetation can significantly offset maintenance requirements, saving money and time while reducing environmental impact.

3.4 Graffiti

There are three elements to a solid graffiti control program: pretreating, deterrents, and removal.

Purpose: Enhance trail user experience, control vandalism cost, and discourage the "broken window" effect which can lead to additional property damage.

Best Practices: *Graffiti Removal and Prevention: What's Working for Bloomington Parks and Recreation* (included in Appendix D of this manual) describes the design choices, policies, and products that have been successfully used with to address graffiti in Bloomington, IN.²²

3.5 Bridges

The value of a bridge includes the direct value of the asset itself as well as the access and continuity it provides.²³ As with road surfaces, preventive nonstructural maintenance can yield significant gains in the longevity of the asset (typically 30-50 years), postponing and reducing major structural rehabilitation or replacement costs.

Purpose: Extend the life-cycle of the asset, and prioritize public safety and access

Best Practices: Bridge owners should establish a program of inspection, condition rating, and preventive maintenance. The Federal Highway Administration Bridges and Structures webpage offers links to applicable legislation and policies, local examples of bridge preservation and maintenance programs, management best practices, and research and development.²⁴

The American Public Works Administration (Preventive Maintenance Programs Keep Your Bridges Open for Years to Come) explains that the sufficiency level of a bridge (based on structural adequacy and safety, serviceability and functional obsolescence,

¹⁹ Simpson, *Best Practices*

²⁰ INDOT, *2013 Design Manual*

²¹ Johnson, *Best Practices Handbook*

²² Williams, *Graffiti Removal*

²³ Herbst, *Preventive Maintenance Programs*

²⁴ USDOT, FHWA, *Bridges and Structures*

Indiana Local Technical Assistance Program

essentiality for public use, and special reductions) should be reported to the Federal Highway Administration and can be useful in developing a maintenance program like those highlighted in two case studies from Florida.²⁵

The Greater Buffalo-Niagara Regional Transportation Council details best practices for bridge maintenance in the colder climate in the Erie-Niagara area. Cyclical Maintenance includes preventive measures such as bridge washing and debris clearing, deck sealing, steel bearings lubrication, and painting load-carrying steel members. Corrective Maintenance includes replacement of an element (joints, bearings, pedestals, bridge seat/pier cap, or columns/stems) of a bridge that is otherwise in good structural condition.²⁶ The Bridge Maintenance Technical Guide (see pages 9 and 10 of the Guide) lays out the following maintenance activities schedules for Cyclical and Corrective measures:²⁷

Cyclical Activity	Selection Criteria	Cycle
Bridge Washing (including substructure concrete, deck & crack sealing)	All functional structures regardless of CR, priority to structures over highways.	2 years
Deck Sealing (including crack & substructure concrete, sealing)	Concrete wearing surfaces (present wearing surface codes 02, 03, 06, 12, 22, 32, 42, 45, 52 in RC 15 of BDMS) rated ≥ 5.0 on structures rated 4.5 to 7. <ul style="list-style-type: none"> • 02 - Portland Cement concrete overlay • 03 - Precast Portland Cement Concrete Plank • 06 - Integral or Monolithic Portland Cement Concrete • 12 - Bonded Concrete • 22 - Concrete with membrane • 32 - High Density Concrete • 42 - Latex Modified Concrete • 45 - Micro-Silica Overlay • 52 - Class "HP" Concrete 	6 years
Bridge Painting	Painted structures (coating types 1, 2 or 3 in RC 15 of BDMS) on structures rated 4.5 to 7. <ul style="list-style-type: none"> • 1 - Painted, Lead-Based • 2 - Painted, Not Lead-Based • 3 - Painted, Unknown 	12 years
Deck Overlay	Wearing surfaces (present wearing surface codes 04, 14, 24, 34, 44, 54, 64 in RC 15 of BDMS) on structures rated 4.5 to 7. <ul style="list-style-type: none"> • 04 - Asphalt Concrete • 14 - Asphalt Concrete without Membrane • 24 - Asphalt Concrete with Membrane • 34 - Asphalt Concrete with Preformed Sheet Membrane • 44 - Asphalt Concrete with Coal Tar Epoxy Membrane • 54 - Asphalt Concrete with Membrane other than Coal Tar • 64 - Asphalt Concrete with Mastic Membrane 	12 years

²⁵ Herbst, Preventive Maintenance Programs

²⁶ Greater Buffalo-Niagara Regional Transportation Council, p. 3

²⁷ Greater Buffalo-Niagara Regional Transportation Council, pp. 9-10

Corrective Activity	Selection Criteria	Objective
"5 – 7" Program	Bridges in generally good condition (Condition Rating > 4.8) that have individual structural elements that are deficient (Element Ratings < 5).	Repair the deficient element and thus extend the non-deficient life of the bridge.
"Vertical Down"	Structures with average condition rating between 4.8 and 6 with a substructure condition index ≤ 5.0 .	Repair deficient substructures (i.e. bearings, pedestals, bridge seat/pier cap, columns/stems) where needed
"Joints"	<p>Structures with average condition rating between 4.8 and 6 with joints (Joint Type codes 07, 11, 12, 13, 15, 16, 17, 18, 21, 22, 27, 28, 29, 30, 31, 32, 33, 34 in RC02 and RC15 of BDMS) rated ≤ 5.0.</p> <ul style="list-style-type: none"> • Elastometric <ul style="list-style-type: none"> 07 - expansion 27 - fixed • Armored Elastometric <ul style="list-style-type: none"> 11 - expansion 28 - fixed • Armored Compression Seal <ul style="list-style-type: none"> 12 - expansion 29 - fixed • Compression Seal <ul style="list-style-type: none"> 13 - expansion 30 - fixed • Strip Seal with Integral Armoring Angle <ul style="list-style-type: none"> 15 - expansion 31 - fixed • Strip Seal – Extrusion Anchored to Deck, No Elastometric Concrete <ul style="list-style-type: none"> 16 - expansion 32 - fixed • Strip Seal – Extrusion Embedded in Elastometric Concrete <ul style="list-style-type: none"> 17 - expansion 33 - fixed • Strip Seal – Type Unknown <ul style="list-style-type: none"> 18 - expansion 34 – fixed • Sawed and Filled <ul style="list-style-type: none"> 21 - fixed • Filled, Elastic Material <ul style="list-style-type: none"> 22 - fixed 	Repair deficient joints to prevent water and chlorides from falling onto substructure elements.

Notes: While bridge inspection is only federally mandated for vehicular bridges spanning more than 20 feet, all bridge owners should note that substantial public welfare and financial costs can result from deferred bridge maintenance.

3.6 Pavement

Pavement inspection and maintenance are the most important activities for ensuring trail safety and longevity. Many resources for evaluation of trail surface conditions, ranging from simple ratings systems to complicated integrated planning tools, are available for no cost online. Decisions about preventive maintenance and major reconstruction depend on a host of factors, including available funding and the age of the trail.

Purpose: The benefits of pavement preservation include extended pavement life and reduced long-term expenses through preventative maintenance. FP2 reports that every \$1 spent on pavement preservation yields a savings on future rehabilitation or reconstruction of \$6 to \$10.²⁸ Additionally, Table 7 of Section 2.4 of this document provides the estimated lifecycle extensions for asphalt pavements that can be gained through recommended preventative maintenance applications.

An Indiana LTAP presentation on PASER - Pavement Management offers the following cost-benefit information (per mile of roadway):

Figure 3. Cost Effectiveness of Treatments

Fix Type	Cost (\$ Per Mile)	Added Life ESL	Cost per Year of Added Life
Crack Seal	\$4,000	1 yr.	\$4,000
Seal Coat & CS	\$20,000	4-9 yr.	\$5,000
Overlay	\$100,000	8-12 yr.	\$12,500
Crush & Shape	\$150,000	14 yr.	\$10,700
Reconstruction	\$300,000	15 yr.	\$20,000

Source: Domonkos, Richard. (09/2014). PASER – Pavement Management. Indiana Local Technical Assistance Program. Prepared for 2014 AIC Annual Conference

Best Practices: A comprehensive pavement management system should evaluate four trail characteristics: roughness (ride), surface distress (condition), surface skid characteristics, and structure (pavement strength and deflection). Surface condition can be simply evaluated with the rating system outlined in the Asphalt PASER Manual.²⁹

An Indiana LTAP presentation on PASER – Pavement Management shows the correlation of PASER rating and typical treatments:

Figure 4. Typical Treatments Tied to PASER Ratings

Rating 9 & 10	No Maintenance Required
Rating 8	Little or No Maintenance
Rating 7	Routine Maintenance – Crack Seal, Patching
Rating 5 & 6	Preservative Treatments – Sealcoat
Rating 3 & 4	Structural Improvement = Overlay / Recycle
Rating 1 & 2	Reconstruction

Source: Domonkos, Richard. (09/2014). PASER – Pavement Management. Indiana Local Technical Assistance Program. Prepared for 2014 AIC Annual Conference

²⁸ FP2, Why Pavement Preservation

²⁹ Walker, *Pavement Surface and Evaluation*

For planning purposes, a custom inventory which combines PASER ratings with other data (pavement type, width, length, etc.) can be created by using the Wisconsin Information System for Local Roads (WISLR) as a template.

Table 8. Sources of “Check Lists” for Asphalt Pavement Maintenance and Preservation Construction

Title	Website
Crack Seal Application	http://www.fhwa.dot.gov/pavement/preservation/ppcl01.cfm
Chip Seal Application	http://www.fhwa.dot.gov/pavement/preservation/ppcl02.cfm
Fog Seal Application	http://www.fhwa.dot.gov/pavement/preservation/ppcl04.pdf
Thin Hot Mix Application	http://www.fhwa.dot.gov/pavement/preservation/ppcl03.pdf
Slurry Seal Application	http://www.fhwa.dot.gov/pavement/preservation/ppcl13.cfm

Source: FHWA: <http://www.fhwa.dot.gov/preservation>

The Pavement Preservation Checklist Series is available as a mobile app through the Google Play store or the iTunes App store. Additionally, FP2 maintains a helpful “Preservation Toolbox” link on their website homepage that is organized by topic.³⁰

Pavement preservation methods can be categorized as nonstructural preventive maintenance (including surface treatments like slurry surfacing, crack sealing, chip sealing, micro surfacing, rejuvenation, hot and cold in-place recycling and thin-lift hot-mix asphalt paving) or structural preservation.³¹

The following is a maintenance check schedule from Best Practices for Bicycle Trail Pavement Construction and Maintenance in Illinois (p.34):

Table 9. PCC-Surfaced Trail Maintenance Recommendations

Maintenance Task	Maintenance Interval (years)
Check drainage components for proper function, no pooling water	1
Identify and complete joint crack sealing	6
Identify and complete patching	6

Source: <https://www.ideals.illinois.edu/bitstream/handle/2142/45812/FHWA-ICT-12-009.pdf?sequence=2>

Solutions: Surface deterioration can be corrected with fog seal, seal coat, slurry seal, or micro surfacing. Engelmann notes that “each of these treatments is successively more costly but also lasts longer. Fog sealing is least expensive, yields a smooth surface, and lasts four to six years. Seal coating costs more than fog sealing but lasts 6 to 10 years. Slurry sealing is a bit more costly than seal coating and lasts a little longer. Micro surfacing is most expensive and has an 8 to 10 year lifespan.”³²

³⁰ FP2, Home

³¹ FP2, Home

³² Engelmann, “Preventive Maintenance for Recreational Trails”

Table 10. INDOT Standard Materials for Seal Applications

INDOT Standard Specification's Section	Application	Asphalt Emulsion or Paving Grades
404	Seal Coat	RS-2, AE-90, AE-90S, or HFRS-2
408	Sealing Cracks	AE-90, AE-90S, AE-150, or PG64-22
412	Fog Seal	AE-F

Source: http://www.in.gov/indot/files/INDOT_Treatment_Guidelines_for_Pavement_Preservation.pdf

Complete replacement can mean installing a new crushed limestone surface, completely overlaying a crushed limestone or asphalt trail with a new asphalt surface, or replacing of an asphalt trail with a concrete trail. Costs should be on par with the original construction costs, though crew mobilization might be an added complication.³³

Providers in Indiana can be found by searching the IRMCA (Indiana Ready Mix Concrete Association) directory. This directory is available in printable format at http://www.irmca.com/sites/default/files/bin/imagecache/slide/images/irmca.print_directory.pdf. A companion application, IRMCA Directory App, is available for Android and iOS platforms.

Notes: Several agencies and industry groups, including the U.S. Green Building Council and the National Ready Mix Concrete Association (NRMCA), are promoting the use of pervious concrete pavement for trails and paths to mitigate issues of pollutant run off and tree root heaving. NRMCA has developed design, construction, and maintenance procedures as well as certification training programs for producers and contractors.

Several studies report that maintenance costs are lower for porous pavements than for standard asphalt trails. An accounting of costs from a Wisconsin trailway concludes that “by reducing the need for winter plowing, labor, and equipment, Middleton’s cost savings amount to \$3,500 per year compared to regular asphalt trails. Maintenance costs for the crushed rock trail are about \$5,000 per year compared to only \$300 per year for the porous pavement. The trail is cleaned a couple of times a year with sweepers or blowers to remove accumulations of leaves or dirt.

Additionally, there is support for using “porous asphalt as an overlay for existing asphalt trails that have begun to deteriorate. While the old impermeable layer will not let much moisture through, the real benefit is the flexibility of the porous overlay. Even where unstable soils keep shifting the trail base, cracks do not seem to show through the top layer of porous asphalt.”³⁴

The Director of the Luray-Hawksbill Greenway in Virginia notes that routine maintenance for porous pavements includes bi-annual vacuuming to remove accumulations of dirt and debris, annual vacuuming and fine gravel replacement, and weekly to monthly sweeping or blowing.³⁵

See Appendix B for additional information on porous pavements.

³³ St. John’s County, *Greenway, Blueway, and Trails Master Plan*

³⁴ Macdonald, *Porous Asphalt Shows Advantages*

³⁵ Beard, *Permeable Pavement Benefits*

3.7 Seasonal Issues

Snow, ice, and flooding can pose serious seasonal threats to the integrity of the trail pavement and to trailway access. According to FP2, “Poor drainage is the single most common problem that leads to premature failures on all types of pavements. It can be responsible for rutting, cracking, potholes, erosion, washouts, heaving and flooding and eventual premature roadway failure. Estimated life extension: 5-20 years.”³⁶

Balancing public safety with environmental stewardship and efforts to control maintenance costs can be challenging, as many of the popular deicing products contain harmful agents (calcium and magnesium chloride, particularly) that can leach into the surrounding landscape and can damage pavement integrity over time. Operators of privately-funded trails can weigh these competing goals when setting a winter weather policy; conversely, trails that are constructed with federal funds must be kept clear and passable, as mandated by several federal regulations, including the Americans With Disabilities Act. Exceptions to this requirement are made for situations (for example, an ice storm or a flood) which pose a public hazard, as determined by local authorities; in these scenarios, local authorities may close the trailway until the hazard is resolved. However, not having a maintenance program in place to address routine inclement weather conditions is not grounds for trailway closure.³⁷

Purpose: Ensure public access and protect the trail pavement.

Best Practices: Minnesota LTAP’s *Minnesota Snow and Ice Control Handbook* covers preparations in advance of snow and ice events, as well as removal options.³⁸

The Winter Parking Lot and Sidewalk Maintenance Manual has detailed information (including cost estimates and product information) for deicing and other removal options.³⁹

“Drainage Maintenance and Repair” offers concise information on the actions needed to protect pavement from ground water and rain.⁴⁰

Indiana Drainage Handbook offers in-depth review of best practices and applicable policies.⁴¹

Note: Correcting drainage problems can cause unintended problems, particularly near slopes where improved drainage can result in slope erosion.

Costs for snow removal can vary dramatically. A Milwaukee study reports that “Snow removal costs range from \$24.13/mile on the Glacial Drumlin Trail - E to \$154.13/mile on the Red Cedar State Trail.”⁴²

For more on environmental impacts of deicers, see Stanko et al. “Do Road Salts Cause Environmental Impacts?”

Porous pavements require little or no salt application and suffer minimal surface damage from freezing weather conditions. The primary reason is that the design does not allow water to accumulate and freeze. A study from Wisconsin notes that, “...ice and snow tended to linger on the traditional surfaces while melting away quickly on the porous asphalt surface. Apparently as some melting takes place during the day, the water re-freezes on the impervious asphalt. The porous material is able to absorb a great deal of water as it melts, gradually leaving the surface ice-free.”⁴³ A report for the Luray-Hawksbill Greenway in Virginia notes that porous pavement does not require annual maintenance such as crack sealing, and that plowing is a sufficient response to winter weather.⁴⁴

³⁶ FP2, Drainage Maintenance and Repair

³⁷ 10/29/2014, Private Communication with Michael Cales

³⁸ Minnesota LTAP, *Minnesota Snow and Ice Control*

³⁹ Dindorf, *Winter Parking Lot and Sidewalk Maintenance*

⁴⁰ FP2, *Drainage Maintenance and Repair*

⁴¹ Indiana DNR, *Indiana Drainage Handbook*

⁴² Milwaukee County, Construction and Maintenance Costs

⁴³ Macdonald, Porous Asphalt Show Advantages

⁴⁴ Beard, Permeable Pavement Benefits

References

- (2014, October 29). Private phone communication with Michael Cales, Local Programs Specialist, INDOT.
- (2014, November 7). Private email communication with Amy Hartzog and Dawn Ritchie, City of Fort Wayne and Fort Wayne Trails.
- Beard, E. (2012, July 1). Permeable pavement benefits for parks. *Parks & Recreation*. Retrieved from <http://www.parksandrecreation.org/2012/July/Permeable-Pavement-Benefits-for-Parks/>
- Center for Environmental Excellence by AASHTO. (2014). Transportation: Paving the way for walking and biking. *Taking the High Road*, 47-56. Retrieved from <http://environment.transportation.org/pdf/HighRoad/HighRoad-Full.pdf>
- City of Bloomington, IN. (2014). Bloomington, IN sample construction contract agreement.
- Clementino, L. M. (2010, August). *Deferred maintenance in the national park service and preservation goals for the 2016 centennial and beyond* (Master's Thesis). Retrieved from: https://getd.libs.uga.edu/pdfs/clementino_lauren_m_201008_mhp.pdf
- County Road Association of Michigan & Michigan Department of Transportation. (NA). *PASER cooperative road condition survey demonstration project*. Retrieved from: <http://www.michiganltap.org/sites/ltap/files/publications/technical/paser.pdf>
- Dindorf, C., & Fortin, C. (2006, Revised June 2010). *Winter parking lot and sidewalk maintenance manual*. Minnesota Pollution Control Agency. Retrieved from: <http://www.pca.state.mn.us/index.php/view-document.html?gid=13562>
- Domonkos, R. (2014, September 24). *PASER: Pavement management*. Indiana Local Technical Assistance Program. Prepared for 2014 AIC Annual Conference.
- Engelmann, J. (2012). Preventive maintenance for recreational trails. *Minnesota LTAP: Technology Exchange 20(1)*. Retrieved from: <http://www.mnltap.umn.edu/publications/exchange/2012/winter/preventative.html>
- FP2 For Pavement Preservation. (2013, May 21). Drainage maintenance and repair. *FP2 For Pavement Preservation*. Retrieved from: <http://www.fp2.org/2013/05/21/drainage-repair/>
- FP2 For Pavement Preservation. (2013). Home. *FP2 For Pavement Preservation*. Retrieved from: <http://www.fp2.org>
- FP2 For Pavement Preservation. (2013). Why pavement preservation? *FP2 For Pavement Preservation*. Retrieved from: <http://www.fp2.org/why-pavement-preservation/>
- Greater Buffalo-Niagara Regional Transportation Council. (2007, January 3). *Bridge preventive maintenance strategy for Erie-Niagara local bridge owners*. Retrieved from: http://www.gbnrtc.org/files/2313/2801/7811/BPMS_Local_Bridges_-_FINALApproved_ReportJan07.pdf
- Herbst, J., Ruiz, R., & Lorick, H. (2007, September). Preventive maintenance programs keep your bridges open for years to come. *APWA Reporter*. Retrieved from: <http://www.apwa.net/resources/reporter/articles/2007/9/preventive-maintenance-programs-keep-your-bridges-open-for-years-to-come>
- Indiana Department of Natural Resources. (2011). *2011 Indiana manual on uniform traffic control devices, revisions 1 & 2*. Retrieved from: <http://www.in.gov/dot/div/contracts/design/mutcd/2011rev2MUTCD.htm>

Indiana Department of Natural Resources. (2013). Chapter 51: Special Design Elements. 2013 *Indiana design manual*. Retrieved from: http://www.in.gov/indot/design_manual/files/Ch51_2013.pdf

Indiana Department of Natural Resources. (2014). *Indiana drainage handbook*. Retrieved from: <http://www.in.gov/dnr/water/4893.htm>

Indiana Department of Transportation. (2014). *Bicycle and pedestrian program*. Retrieved from: <http://www.in.gov/indot/2828.htm>

Indiana Department of Transportation. (2011, March 7). *Indiana safe routes to school program: Table of typical pedestrian and bicycle facility costs*. Retrieved from: http://www.in.gov/indot/files/SRTS_BikePedFacilityCosts_0311.pdf

Indiana Department of Transportation. (2014). *Pay items: Unit price summaries*. Retrieved from: <http://www.in.gov/dot/div/contracts/pay/>

Indiana Department of Transportation. (2014). *Trails and greenways*. Retrieved from: <http://www.in.gov/indot/2437.htm>

Johnson, A. (2000, September). *Best practices handbook on roadside vegetation management*. Report No. Mn/DOT 2000-19. University of Minnesota Center for Transportation Studies, Minnesota Technology Transfer / LTAP Program. Retrieved from: <http://www.lrrb.org/media/reports/200019.pdf>

Kuehl, R., Marti, M., & Schilling, J. (2008, February). *Resource for implementing a street sweeping best practice*. Report No. MN/RC – 2008RIC06. Minnesota Department of Transportation. Retrieved from: <http://www.mnltap.umn.edu/topics/stormwater/documents/sweeping.pdf>

Lee, J., & Shields, T. (2010, January). *Treatment guidelines for pavement preservation*. Report No. FHWA/IN/JTRP 2010/01. INDOT Office of Research and Development. Retrieved from: http://www.in.gov/indot/files/INDOT_Treatment_Guidelines_for_Pavement_Preservation.pdf

Macdonald, S. (Winter 2011). Porous asphalt shows advantages for trail surfacing. *American Trails* 40(3), 28-30. Retrieved from: <http://www.americantrails.org/resources/trailbuilding/Porous-asphalt-Middleton-Wisconsin.html>

Milwaukee County Dept. of Parks, Recreation, and Culture. (2007). Construction and maintenance costs for trails. *American Trails*. Retrieved from: <http://www.americantrails.org/resources/ManageMaintain/MilwMaintcost.html>

Minnesota LTAP. (2012, October). *Minnesota snow and ice control: Field handbook for snowplow operators, second revision*. Minnesota Local Road Research Board. Retrieved from: <http://www.mnltap.umn.edu/publications/handbooks/documents/snowice.pdf>

National Center for Pavement Preservation. (2012, January 20). *Changing course to preserve america's roads*. [Video file]. Retrieved from: <https://www.youtube.com/watch?v=SDObEGaS8dU>

Net Tango, Inc. (2013, May 6). Louisville mobile app. <https://itunes.apple.com/us/app/louisville-mobile/id396209000?mt=8>

Poole, Tim. (2005, July). Appendix 2, table 16: Frequency of common maintenance tasks. *Rails trail maintenance and operation: Ensuring the future of your trail – A survey of 100 rails-trails*. Rails to Trails Conservancy Northeast Regional Office. Retrieved from: <http://www.railstotrails.org/resource-library/resources/rail-trail-maintenance-operation-ensuring-the-future-of-your-trail-a-survey-of-100-rail-trails/>

Simpson, D., Buttlar, W., & Dempsey, B. (2012, June). *Best practices for bicycle trail pavement construction and maintenance in Illinois*. Research Report FHWA-ICT-12-009. Illinois Center for Transportation. Retrieved from: <https://www.ideals.illinois.edu/bitstream/handle/2142/45812/FHWA-ICT-12-009.pdf?sequence=2>

Indiana Local Technical Assistance Program

- Smart Growth America. (2011). *Repair priorities 2014: Transportation spending strategies to save taxpayer dollars and improve roads*. Smart Growth America. Retrieved from: <http://www.smartgrowthamerica.org/repair-priorities-2014>
- St. John's County, HDR, & Rivers Trails and Conservation Assistance Program. (2003, November). Trail operation, maintenance, and management. *Greenway, blueway, and trails master plan*. HDR. Retrieved by: www.sjcfl.us/LAMP/media/FinalReport.pdf
- Stranko, S., Bourquin, R., Zimmerman, J., Kashiwagi, M., McGinty, M., & Klauda, R. (2013, April). *Do road salts cause environmental impacts?* Maryland Department of Natural Resources. Retrieved from: <http://www.dnr.state.md.us/streams/pdfs/RoadSalt2013.pdf>
- U.S. Department of Transportation & Federal Highway Administration. (2014). Guidance. *Bicycle & pedestrian program*. Retrieved from: http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/bp-guid.cfm#bp4
- U.S. Department of Transportation & Federal Highway Administration. (2014). *Bridges and structures*. Retrieve from: <http://www.fhwa.dot.gov/bridge/preservation/research.cfm>
- U.S. Department of Transportation & Federal Highway Administration. (2014). *Preservation*. Retrieved from: <http://www.fhwa.dot.gov/preservation/>
- U.S. Department of Transportation & Federal Highway Administration. (2013, August). *The manual on uniform traffic control devices peer-to-peer program*. Retrieved from <http://mutcd.fhwa.dot.gov/peer2peer/brochure/index.htm>
- U.S. Department of Transportation & Federal Highway Administration. (2014, May). *Recreational trail programs*. Retrieved from: http://www.fhwa.dot.gov/environment/recreational_trails/overview/
- Walker, D. (2002). *PASER manual: Asphalt roads*. Transportation Information Center, University of Wisconsin-Madison. Retrieved from: <http://www.apa-mi.org/docs/Asphalt-PASERManual.pdf>
- Williams, D. (2014). *Graffiti removal and prevention: What's working for Bloomington Parks and Recreation*.

Appendix A: Ohio River Greenway Commission

Table A1. ORGC Advisory Committees

Title	Function
Steering Committee	Set agenda for ORGC
Design and Construction	Consult on technical design and construction issues
Community Outreach / Friends of the Greenway	Coordinate volunteers and community events.
Finance and Funding	Pursue funding

Table A2. Members of the Ohio River Greenway Commission, October 2014

Name	Position
Clarksville	
Patrick Duggins	Clarksville Appointee
Jim McCoskey	Clarksville Appointee
Bob Polston	Clarksville President Town Council
New Albany	
Unappointed (10/27/14)	New Albany Appointee
Jeff Gahan	New Albany Mayor
Pat Leist-Stumler	New Albany Appointee; ORGC Treasurer
Jeffersonville	
David Boome	Jeffersonville Appointee; ORGC Vice-Chair
Philip Hendershot	Jeffersonville Appointee; ORGC Chair
Mike Moore	Jeffersonville Mayor
Non-voting Members	
Wendy Dant Chesser	One Southern Indiana
Jim Epperson	Southern Indiana Tourism Bureau
Matt Hall	One Southern Indiana
Kelly Morgan	DNR – Falls of the Ohio
Jim Ude	INDOT
Governor's Appointees	
Jay G. Conner	Clark County Appointee
Ed Jerdonek	Floyd County Appointee
Staff	
Meredith Gainer	Administrative Assistant
Shaunna Graf	Project Director
USACE	
Jim Childs	Construction Manager
Carol Labashosky	Public Affairs Officer
Matt Schueler	Project Manager

Appendix B: Additional Resources

ADDITIONAL INFORMATION ON PAVEMENT MAINTENANCE

Asphalt Institute. (2009). *Asphalt in pavement preservation and maintenance*. Asphalt Institute Manual Series MS-16. www.asphaltinstitute.org

Simpson, D., Buttlar, W., & Dempsey, B. (2012, June). *Best practices for bicycle trail pavement construction and maintenance in Illinois*. Report number FHWA-ICT-12-009. Illinois Department of Transportation. <http://hdl.handle.net/2142/45812>

FP2 for Pavement Preservation. [website]. <http://www.fp2.org/>

U.S. Department of Transportation & Federal Highway Administration. (2005, August). *Asphalt concrete (for local agencies) distress identification guide*. Publication No. LTAP-05-001. Retrieved from: <http://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltp/06119/index.cfm>

Walker, D. (2002). *PASER manual: Asphalt roads*. Transportation Information Center, University of Wisconsin-Madison. Retrieved from: <http://www.apa-mi.org/docs/Asphalt-PASERManual.pdf>

ASPHALT PAVEMENT PREVENTATIVE MAINTENANCE VIDEOS

Craftco crack sealing instruction manual: <https://www.youtube.com/watch?v=53uVzix9Wko>

Crack sealing asphalt pavement (part 1): <https://www.youtube.com/watch?v=if9Pw4julG8>

Crack sealing asphalt pavement (part 2): <https://www.youtube.com/watch?v=jnjfr-twWjw>

Crack repair in asphalt concrete pavement: <https://www.youtube.com/watch?v=g50xu7jl6Kw>

Preventative maintenance: <https://www.youtube.com/watch?v=51YLS6WBmnI>

Slurry seal Kuihelani Hwy, Maui, HI: <https://www.youtube.com/watch?v=a9qJoRFQYMU>

PASS scrub seal, City of Vista: <https://www.youtube.com/watch?v=U7BOen-nAsA>

Microsurfacing project, western emulsions: <https://www.youtube.com/watch?v=gJU71Jy6cck>

Chip seal application (LTAP): https://www.youtube.com/watch?v=X8PY0WX9__s

IRMCA APP DIRECTORY

<https://play.google.com/store/apps/details?id=edu.purdue.irmca.directory>

<https://itunes.apple.com/us/app/indiana-ready-mix-concrete/id776122426?mt=8>

INFORMATION ON PERVIOUS CONCRETE

Beard, E. (2012, July 1). Permeable pavement benefits for parks. *Parks & Recreation*. <http://www.parksandrecreation.org/2012/July/Permeable-Pavement-Benefits-for-Parks/>

Macdonald, S. (Winter 2011). Porous asphalt shows advantages for trail surfacing. *American Trails* 40(3), 28-30. <http://www.americantrails.org/resources/trailbuilding/Porous-asphalt-Middleton-Wisconsin.html>

NRMCA. (2011). *Pervious pavement*. <http://www.perviouspavement.org/>

NRMCA. (2012). Contractor certification program. http://www.nrmca.org/Education/Certifications/Pervious_Contractor.htm

ASSET MANAGEMENT TOOLS

Eppley Institute for Parks and Public Lands. (2014). <http://eppley.org/category/resources/tools/>

WINTER WEATHER MAINTENANCE BEST PRACTICES

Cebe, J. (2014, February). Winter bike lane maintenance: A review of national and international best practices. *Perspectives in planning white paper 2*(1). Alta Planning + Design. <http://www.altaplanning.com/wp-content/uploads/winter-bike-riding-white-paper-alta.pdf>

Easter Seals Project Action. (2013, Fall). Effective snow removal for pathways and transit stops. *Update 25*(4). http://www.adainformation.org/sites/adainformation.org/files/snow_removal_policies.pdf

Seskin, S. (2014, January 7). How do you shovel a bike lane? New resources for maintaining Complete Streets in snowy weather. *Smart Growth America*. <http://www.smartgrowthamerica.org/2014/01/07/how-do-you-shovel-a-bike-lane-new-resources-for-maintaining-complete-streets-in-snowy-weather/>

ESTIMATED COSTS (INCLUDING MAN HOURS) REQUIRED FOR MAINTENANCE ACTIVITIES

McCormick, T., & Assoc. (2007, April 16). Maintenance costs for the Schuylkill trail. *American Trails, Trails Maintenance and Management*. <http://www.americantrails.org/resources/ManageMaintain/SchuylMaint.html>

RECOMMENDED MAINTENANCE SCHEDULES AND SCHEDULING TEMPLATES

Greenways, Inc., & Arbor Engineering. (2007, August). Chapter 6: Operations and maintenance, section 6.3 routine and remedial maintenance. *Trails & greenways master plan*. <http://www.greenvillesc.gov/PlanningZoning/MasterPlans.aspx>

Public Sector Consultants, Inc. (2007, March). Appendix B: Frequency of maintenance activities. *Statewide greenways maintenance inventory and case studies*. Michigan Trails and Greenway Alliance. <http://www.michigantrails.org/sites/default/files/statewide-trails-maintenance-inventory-and-case-studies.pdf>

COMPARISONS OF AVAILABLE TRAIL SURFACING OPTIONS

Anasazi Trails. (2014). *Rio Grande trail corridor study: Trail surfacing report*. *American Trails*. <http://www.americantrails.org/resources/trailbuilding/Rio-Grande-Trail-Surfacing.html>

Comprehensive Manual on Policies and Practices for Pedestrian Facilities Maintenance USDOT & FHWA. (2013, October). *A guide for maintaining pedestrian facilities for enhanced safety*. http://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa13037/

Appendix C: Assets Inventory

Table C.1. Template for Taking an Inventory of Ohio River Greenway Assets

Asset	Make/Model	Supplier	Photo	Maintenance Notes	Jurisdiction
Trash can					
Bollard					
Limestone wall					
Bench					
Water Fountain					
Picnic Bench					
Restroom					
Lighting					
Handrail					
Safety and Informational Sign					
Pavement Markings					
Pavement					
Parking Lots					
Tree Canopy					
Landscaping					
Culverts					
Bridges					
Retaining Walls					

Appendix D: Bloomington, IN, Parks and Recreations Graffiti Removal and Prevention Program

Graffiti Removal and Prevention

What's Working for Bloomington Parks and Recreation

Bloomington Parks and Recreation, like many urban park departments, is challenged with frequent incidents of graffiti on its trails and other facilities. Substantial resources in labor, equipment, and materials are expended toward our graffiti removal and prevention program. We subscribe to the “broken window” philosophy; when damage caused by graffiti or vandalism is not attended to immediately it can create a negative impression to the public that no one cares, and the site will continue to be vandalized. We also find that rapid response can result in graffiti taggers going elsewhere, knowing their work may not be on display for an extended period of time at our facilities.

Design Details and Deterrents

Pay attention to the details of your trail's design; especially vertical elements (light poles, signs and sign posts), site furniture, building exteriors and finishes, and signage.

- Consider “fluted” poles for lighting, sign posts, and other trail features. From our experience, fluted (vs. smooth metal or wood surfaces) poles are more difficult to attach stickers and signs and are less frequently tagged.
- Consider using the color black for site amenities such as trash receptacles, benches, and tables. If multiple manufacturers of site furniture are used, there will be subtle differences in the same color of blue, green, etc. This can make covering over the graffiti by painting a more difficult task, often requiring an inventory of several different color shades of paint. The color black is standard regardless of manufacturer, and cans of paint or spray paint in different sheens are readily available at the local hardware store.
- Be careful with site furniture that has expansive smooth, flat, surface areas prone to being tagged more frequently. Consider slatted steel benches over other materials. When purchasing tables, consider designs that have perforated, slatted, or punched hole seats and tops.
- When using limestone, consider using “rock face” or roughened surfaces to deter graffiti. Tagging on smooth limestone, due to its porosity, can be very difficult to remove.
- Painting the backside of stop signs and other signage black can deter tagging, and if tagged, makes covering over with spray paint an easier task.
- For expansive exterior surfaces such as building exteriors, retaining walls, and bridges, consider employing an artist to create artwork or a mural. We have found this to be a cost effective deterrent to graffiti on frequently tagged outdoor facilities such as restrooms, as artwork by others may be left alone by taggers.
- When using informational or interpretive signage, consider products that feature a high pressure layered laminate process that helps preserve the sign image when graffiti removal products are used.

Removal Products and Equipment

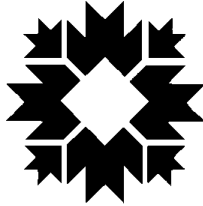
We have tested numerous graffiti removal products and have settled in on three products. The active ingredients in the products listed below are likely available from numerous other manufacturers. It's critically important that staff who use these products read the labels and wear personal protection equipment such as gloves and eye protection. The key to any removal is a rapid response. The longer the tag is allowed to remain on the surface, the more difficult it can be to remove.

- *Elephant Snot*. Manufactured by: Momar-Atlanta GA
 - ♦ Apply product with a good quality paint brush. This product works best in temperatures above 45 degrees. Let the product set for 45 minutes and remove with a pressure washer using hot water. Excellent for removal of graffiti on limestone.

Indiana Local Technical Assistance Program

- *Mark Off*. Manufactured by: Momar-Atlanta GA
 - ♦ Excellent product for removal of graffiti from markers, crayons, or paint.
 - ♦ Spray on surface and let set for minute; wipe off. May require a repeat application. Product can also be removed with high pressure water.
- *Blister*. Manufactured by: Momar-Atlanta GA
 - ♦ Works well on stone, brick, and other masonry surfaces. Spray on and let set for three minutes. Remove by using a pressure washer using hot water. Product works as a paint stripper and is also effective for removal of decals and stickers.
- We use a trailer mounted pressure washer unit with heated water for most removals and find this piece of equipment to be critical important to our efforts. These rigs are expensive (~\$7,500), but the combination of heated water and high pressure water works extremely well and causes minimal, if any, damage to the tagged surface.

Appendix E: Bloomington, IN, Sample Construction Contract Agreement



**CITY OF BLOOMINGTON
parks and recreation**

AGREEMENT

BETWEEN

**The City of Bloomington, Indiana
Department of Parks and Recreation**

AND

FOR

PROJECT NO. BPR-----

THIS AGREEMENT, executed by and between the City of Bloomington, Indiana, Board of Parks Commissioners (hereinafter CITY), and ----- (hereinafter CONTRACTOR);

WITNESSETH THAT:

Indiana Local Technical Assistance Program

WHEREAS, CITY is desirous of -----
----- (more particularly described in Attachment A,
“Summary of Work:”; and

WHEREAS, CONTRACTOR is capable of performing all applicable work for -----
-----; and

WHEREAS, said proposal was determined to be the lowest responsible and responsive proposal for said project.

NOW, THEREFORE, in consideration of the mutual promises hereinafter enumerated, the parties agree as follows:

ARTICLE 1. TERM

1.01 This Agreement shall be in effect upon execution of this Agreement by all parties.

ARTICLE 2. SERVICES

2.01 CONTRACTOR shall complete all work required under this Agreement within --**calendar days from the written Notice to Proceed**. Substantial Completion shall be considered to be completion of all work.

2.02 It is hereby understood by both parties that time is of the essence in this Agreement. Failure of CONTRACTOR to complete all work as herein provided will result in monetary damages to CITY. It is hereby agreed that CITY will be damaged for every day the work has not been performed in the manner herein provided and that the measure of those damages shall be determined by reference to the then current INDOT Schedule of Liquidated Damages for Each Day of Overrun in Contract Time. CONTRACTOR agrees to pay CITY said damages or, in the alternative, CITY, at its sole discretion, may withhold monies otherwise due CONTRACTOR. It is expressly understood by the parties hereto that these damages relate to the time of performance and do not limit CITY’s other remedies under this Agreements, or as provided by applicable law.

2.03 CONTRACTOR agrees that no charges or claims for damages shall be made by him for any delays or hindrances, from any cause whatsoever during the progress of any portion of the services specifies in the Agreement. Such delays or hindrances, if any, may be compensated for by an extension of time for reasonable period as may be mutually agreed upon between the parties, it being understood, however, that permitting of CONTRACTOR to proceed to complete any service, or any part of the, after the date to which the time of completion may have been extended, shall in no way operate as a waiver on the part of CITY or any of its rights herein.

ARTICLE 3. COMPENSATION

3.01 CONTRACTOR shall provide services as specified in Attachment A, “Scope of Work”, attached hereto and incorporated into this Agreement.

3.02 Upon the submittal of approved claims, CITY shall compensate CONTRACTOR in lump sum of ----- (\$#####). CITY may withhold payment, in whole or in part to the extent necessary to protect itself from a loss on account of any of the following:

1. Defective work.
2. Evidence indicating the probable filing of claims by other parties against CONTRACTOR which may adversely affect CITY.
3. Failure of CONTRACTOR to make payments due to subcontractors, material suppliers or employees.
4. Damage to CITY or a third party.

3.03 The submission of any request for payment shall be deemed a waiver and release by CONTRACTOR of all liens and claims with respect to the Work and period to which such payment request pertains except as specifically reserved and noted on such request.

3.04 CONTRACTOR shall maintain proper account records for the scope of all services of this Agreement and provide an accounting for all charges and expenditures as may be necessary for audit purposes. All such records shall be subject to inspection and examination by CITY's representatives at reasonable business hours.

3.05 CONTRACTOR shall submit time sheets (WH-347) for his own and all subcontracted employees, to City Contract Compliance Officer or his/her representative for approval and review, including review for compliance with Prevailing Wage requirements, if applicable to the project.

ARTICLE 4. GENERAL PROVISIONS

4.01 CONTRACTOR agrees to indemnify and hold harmless CITY and its officers, agents, officials and employees for any and all claims, actions, causes of action, judgments and liens arising out of and negligent act or omission by CONTRACTOR or any of its officers, agents, officials, employees, or subcontractors or any defect in materials or workmanship of any supply, materials, mechanism or other product or service which it or any of its officers, agents, officials, employees, or subcontractors has supplied to CITY or has used in connection with this Agreement and regardless of whether or not it is caused in part by a party indemnified hereinunder. Such indemnity shall include attorney's fees and all costs and other expenses arising therefrom or incurred in connection therewith and shall not be limited by reason of the enumeration of any insurance coverage required herein.

4.02 Abandonment, Default and Termination

4.02.01 CITY shall have the right to abandon the work contracted for in this Agreement without penalty. If CITY abandons the work described herein, CONTRACTOR shall deliver to CITY all surveys notes, drawings, specifications and estimates completed or partially completed and these shall become the property of CITY. The earned value of

Indiana Local Technical Assistance Program

the work performed shall be based upon an estimate of the proportion between the work performed by CONTRACTOR under this Agreement and the work which CONTRACTOR was obligated to perform under this Agreement. This proportion shall be mutually agreed upon by CITY and CONTRACTOR. The payment as made to CONTRACTOR shall be paid as a final payment in full settlement of his services hereunder.

4.02.02 If CONTRACTOR defaults or fails to fulfill in a timely and proper manner the obligations pursuant to this Agreement, CITY may, after seven (7) days written notice to has been delivered to CONTRACTOR, and without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due to CONTRACTOR. In the alternative, CITY, at its option, may terminate this Agreement and take possession of the site and of all materials, equipment, tools and construction equipment and machinery thereon owned by CONTRACTOR, and may finish the project by whatever method it may deem expedient, and if the such action exceeds the unpaid balance of the sum amount, CONTRACTOR or his surety, shall pay the difference to CITY.

4.02.03 Default: If CONTRACTOR breaches this Agreement or fails to perform the work in an acceptable manner, he shall be considered in default. Any one or more of the following will be considered a default:

1. Failure to begin the work under this Agreement within the time specified.
2. Failure to perform the work with sufficient supervision, workmen, equipment and materials to insure prompt completion of said work.
3. Unsuitable performance of the work as determined by the Parks and Recreation Department Administrator or his/her representative.
4. Neglecting or refusing to remove defective materials or failure to perform anew such work as shall have been rejected.
5. Discontinuing the prosecution of the work or any part of it.
6. Inability to finance the work adequately.
7. If, for any other reason, CONTRACTOR breaches this Agreement or fails to carry on the work in an acceptable manner.

4.02.04 CITY shall send CONTRACTOR a written notice of default. If CONTRACTOR, or his Surety, within a period of ten (10) days after such notice, fails to remedy the default, then CITY shall have full power and authority, without violation of the Agreement, to take the prosecution of the work out of the hands of said CONTRACTOR, to appropriate or use any or all materials and equipment on the ground as may be suitable and acceptable, and may at his option, turn the work over to the Surety, or enter into an agreement with another Contractor for the completion of the Contract according to the terms and provisions thereof, or CITY may use such other methods as, in its opinion, shall be required for the completion of said Contract in an acceptable manner.

4.02.05 All cost of completing the work under the Contract shall be deducted from the monies due or which may become due said CONTRACTOR. In case the expenses so

incurred by CITY shall be less than the sum which would have been payable under the Contract if it had been completed by said CONTRACTOR, CONTRACTOR shall be entitled to receive the difference. However, in case such expense shall exceed the sum which would have been payable under the Contract, CONTRACTOR and his Surety will be liable and shall pay to CITY the amount of said excess. By taking over the prosecution of the work, CITY does not forfeit the right to recover damages from CONTRACTOR or his Surety for his failure to complete the work in the time specified.

4.02.06 Notwithstanding any other provision of the is Agreement, if funds for the continued fulfillment of the Agreement by CITY are at any time not forthcoming or are insufficient, through failure of any entity to appropriate the funds or otherwise, then CITY shall have the right to terminate this Agreement without penalty by giving prior written notice documenting the lack of funding in which instance unless otherwise agreed to by the parties, this Agreement shall terminate and become null and void on the last day of the fiscal period for which appropriation were received.

4.02.07 CITY agrees that it will make its best effort to obtain sufficient funds, including but not limited to, including in its budget for each fiscal period during the term hereof a request for sufficient funds to meet its obligations hereunder in full.

4.03 Successors and Assigns

4.03.01 Both parties agree that for the purpose of this Agreement, CONTRACTOR shall be an Independent Contractor and not an employee of CITY.

4.03.02 No portion of this Agreement shall be sublet, assigned or otherwise disposed of by CONTRACTOR except with the written consent of the CITY being first obtained. Consent to sublet, assign, or otherwise dispose of any portion of this Agreement shall not be construed to relieve CONTRACTOR of any responsibility of the fulfillment of this Agreement.

4.04 Extent of Agreement: Integration

4.04.01 This Agreement consists of the following parts, each of which is as fully a part of this Agreement as if set out herein:

1. This Agreement
2. Technical Specifications (Attachment A, "Scope of Work)
3. Where applicable, Bid/Quote Prices (Attachment B)
4. Upfront Specifications (Definitions and Bidder's Responsibilities – not applicable for this agreement)
5. CONTRACTOR's submittals (not applicable for this agreement)
6. Federal Wage Requirements (not applicable)

4.04.02 In resolving conflicts, errors, discrepancies and disputes concerning the Scope of Work to be performed by CONTRACTOR, and other rights and obligations of CITY and CONTRACTOR, the document expressing the greater quantity, quality or other scope of

Indiana Local Technical Assistance Program

work in question, or imposing the greater obligation upon CONTRACTOR and affording the greater right or remedy to CITY shall govern; otherwise the documents shall be given precedence in the order as enumerated above.

4.05 Insurance

4.05.01 CONTRACTOR shall, as a prerequisite to this Agreement, purchase and thereafter maintain such insurance as will protect him from the claims set forth below which may arise out of or result from CONTRACTOR's operations under this Agreement, whether such operations be by CONTRACTOR or by any SUBCONTRACTORS or by anyone directly or indirectly employed by any or them, or by anyone for whose acts any of them maybe liable:

<u>Coverage</u>	<u>Limits</u>
A. Workmen's Compensation & Disability	Statutory Requirements
B. Employer's Liability Bodily Injury by Accident	\$100,000 each accident
Bodily Injury by Disease	\$500,000 policy limit
Bodily Injury by Disease	\$100,000 each employee
C. Commercial General Liability (Occurrence Basis) Bodily Injury, personal injury, property damage, contractual liability, products-completed operations, General Aggregate Limit (other than Products/Completed Operations)	\$1,000,000
Products/Completed Operation	\$1,000,000
Personal & Advertising Injury Limit	\$1,000,000
Each Occurrence Limit	\$1,000,000
Fire Damage (any one fire)	\$50,000
Medical Expense Limit (any one person)	\$5,000
D. Comprehensive Auto Liability (single limit, owned, hired and non-owned)	\$1,000,000 each accident
Bodily injury and property damage	\$1,000,000

E. Umbrella Excess Liability \$2,000,000 each occurrence and aggregate

The Deductible on the Umbrella Liability shall not be more than \$10,000

4.05.02 CONTRACTOR's comprehensive general liability insurance shall also provide coverage for the following:

1. Premises and operations;
2. Contractual liability insurance as applicable to any hold-harmless agreements.
3. Completed operations and products; which also must be maintained for a minimum period of two years after final payment and CONTRACTOR shall continue to provide evidence of such coverage to city on an annual basis during the aforementioned period; and
4. Broad form property damage - including completed operations;
5. Fellow employee claims under Personal Injury;
6. Independent Contractors.

4.05.03 With the prior written approval of CITY, CONTRACTOR may substitute different types or amounts of coverage for those specified as long as the total amount of required protection is not reduced.

4.05.04 Certificates of Insurance, naming the City of Bloomington as an "additional insured", showing such coverage then in force (but not less than the amount shown above) shall be on file with CITY prior to commencement of work. These Certificates shall contain a provision that coverages afforded under the policies will not be canceled or non-renewed until at least sixty (60) days prior written notice has been received by CITY.

4.06 Necessary Documentation CONTRACTOR certifies that it will furnish CITY any and all documentation, certification, authorization, license, permit or registration required by the laws or rules and regulations of the City of Bloomington, the State of Indiana and the United States. CONTRACTOR further certifies that it is now and will maintain in good standing with such governmental agencies and that it will keep its license, permit registration, authorization or certification in force during the term of this Agreement.

4.07 Applicable Laws CONTRACTOR agrees to comply with all federal, state, and local laws, rules and regulations applicable to CONTRACTOR in performing work pursuant to this Agreement, including, but not limited to, discrimination in employment, prevailing wage laws, conflicts of interest, public notice, accounting records and requirements. Unless otherwise specified, this Agreement shall be govern by the laws of the United

Indiana Local Technical Assistance Program

States, and the State of Indiana, and by all Municipal Ordinances and Codes of the City of Bloomington.

4.08 Non-Discrimination

4.08.01 CONTRACTOR and subcontractors shall not discriminate against any employee or applicant for employment, to be employed in the performance of this Agreement, with respect to hire, tenure, terms, training, conditions or privileges of employment, because of race, sex, color, religion, national origin, ancestry, age, handicap, or disabled veteran status. Breach of this covenant may be regarded as a material breach of the Agreement.

4.08.01 CONTRACTOR certifies for itself and all its subcontractors compliance with exiting laws of the State of Indiana and the United States regarding:

1. Prohibition of discrimination in employment practices on the basis of race, sex, color, religion, national origin, ancestry, age, handicap, or any other legally protected classification;
2. The utilization of Minority and Women Business Enterprises. CONTRACTOR further certifies that it:
 - a. Has formulated its own Affirmation Action plan for the recruitment, training and employment of minorities and women, including goals and timetable; which has been approved by the City's Contract Compliance Officer.
 - b. Strongly encourages the use of small business, minority-owned business and women-owned business in its operations.

4.08.03 FURTHER, PURSUANT TO IC 5-16-6-1, CONTRACTOR AGREES:

- A) That in the hiring of employees for the performance of work under this Agreement or any subagreement hereunder, no contractor, or subcontractor, nor any person acting on behalf of such CONTRACTOR or subcontractor, shall be reason of race, sex, color, religion, national origin, ancestry, or any other legally protected classification, discriminate against any citizen of the State of Indiana who is qualified and available to perform the work to which the employment relates.
- B) That no contractor, subcontractor, or any person of their behalf, shall, in any manner, discriminate against or intimidate any employee hired for performance of work under this Agreement on account or race, religion, color, sex, national origin, ancestry, handicapped, or any other legally protected classification.
- C) That there may be deducted from the amount payable to CONTRACTOR, by CITY, under this Agreement, penalty of Five Dollars (\$5.00) for each person for each

calendar day during which such person was discriminated against or intimidated in violation of the provisions of this Agreement. Any such person discriminated against retains the right to file a discrimination complaint with the appropriate civil rights agency or court.

- D) That this Agreement may be canceled or terminated by CITY and all money due or to become hereunder may be forfeited, for a second or any subsequent violations of the terms or conditions under this section of the Agreement.

4.09 Workmanship and Quality of Materials

4.09.01 CONTRACTOR shall guarantee the work for a period of one (1) year from the date of substantial completion. Failure of any portion of the work within one (1) year due to improper construction, materials of construction, or design may result in a refund to CITY of the purchase price of that portion which failed or may result in the forfeiture of CONTRACTOR's Performance Bond.

4.09.02 OR EQUAL: Wherever in any of the Contract Documents an article, material or equipment is defined by describing a proprietary product, or by using the name of a manufacturer or vender, the term "Or Equal" or the term "The Equivalent" if not inserted, shall be implied, and it is done for the express purpose of establishing a basis of durability and efficiency and not for the purpose of limiting completion. Whenever material or equipment is submitted for approval as being equal to that specified, the submittal shall include sufficient information and data to demonstrate that the material or equipment conforms to the Contract requirements. The decision as to whether or not such material or equipment is equal to that specified shall be made by the Parks and Recreation Department Administrator or his/her representative. The approval by the ADMINISTRATOR of alternate material or equipment as being equivalent to that specified, shall not in any way relieve CONTRACTOR of responsibility for failure of the material or equipment due to faulty design, material, or workmanship, to perform the function required by the Contract Documents.

4.09.03 CITY shall be the sole judge of the sufficiency of workmanship and quality of materials. Disputes shall be resolved by the Parks and Recreation Department Administrator and are not subject to arbitration.

4.10 Safety. CONTRACTOR shall be responsible for the safety of employees at all times and shall provide all equipment necessary to insure their safety. CONTRACTOR shall ensure the enforcement of all applicable safety rules, regulations, ordinances and laws, whether federal, state or local.

4.11 Amendments/Changes

4.11.01 Except as provided in Paragraph 4.11.02, this Agreement may be amended only by written instrument signed by both CITY and CONTRACTOR.

Indiana Local Technical Assistance Program

4.11.02 Without invalidating the Agreement and without notice to any surety, CITY may at any time or from time to time, order, in writing, additions, deletions or revisions in the Work. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents.

4.11.03 If CONTRACTOR believes that any direction of CITY under paragraph 4.11.02, or any other event or condition, will result in an increase in the Contract time or price, he shall file written notice with CITY no later than twenty (20) days after the occurrence of the event giving rise to the claim and stating the general nature of the claim with supporting data. No claim for any adjustment of the Contract time or price will be valid if not submitted in accordance with this Paragraph.

4.11.04 CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with CITY. No work shall be delayed or postponed pending resolution of any dispute or disagreement except as CONTRACTOR and CITY may otherwise agree in writing.

4.12 Performance Bond and Payment Bond

4.12.01 CONTRACTOR shall provide CITY with a Performance Bond and Payment Bond in the amount of one hundred percent (100%) of the contract amount.

4.12.02 Failure by CONTRACTOR to perform the work in a timely or satisfactory fashion may result in forfeiture of CONTRACTOR's Performance Bond.

4.12.03 If the surety on any bond furnished by CONTRACTOR becomes a party to supervision, liquidation, rehabilitation action pursuant I.C. 27-9 *et seq.* or its right to do business in the State of Indiana is terminated, CONTRACTOR shall, within thirty days thereafter, substitute another bond and surety, both of which must be acceptable to CITY.

4.13 Payment of Subcontractors CONTRACTOR shall pay all subcontractors, laborers, material suppliers and those performing services to CONTRACTOR on the project under this Agreement. CITY may, as a condition precedent to any payment hereunder, require CONTRACTOR to submit satisfactory evidence of payments of any and all claims of subcontractors, laborers, material suppliers, and those furnishing services to CONTRACTOR. Upon receipt of a lawful claim, CITY shall withhold money due to CONTRACTOR in a sufficient amount too pay the subcontractors, laborer, material suppliers, and those furnishing services to CONTRACTOR.

4.14 Written Notice Written notice shall be considered as served when delivered in person or sent by mail to the individual, firm, or corporation, or to the last business address of such known to CONTRACTOR who serves the Notice. Notice shall be sent as follows:

TO CITY:

TO CONTRACTOR:

Showers City Hall -----
Post Office Box 848 -----
Bloomington, Indiana 47402 -----

4.15 Severability and Waiver In the event that any clause or provision of this Agreement is held to be invalid by any court of competent jurisdiction, the invalidity of such clause or provision shall not affect any other provision of this Agreement. Failure of either party to insist on strict compliance with the provision of this Agreement shall not constitute waiver of that party's right to demand later compliance with the same or other provisions of this Agreement.

4.16 Notice to Proceed CONTRACTOR shall not begin the work pursuant to the "Scope of Work" of this Agreement until it receives an official written Notice to Proceed from the City. Contractor shall start active and continuous work on the contract within 15 calendar days after the date of the Notice to Proceed. In no case shall work being prior to the date of the Notice to Proceed. If a delayed starting date is indicated in the proposal, the 15 calendar day limitation will be waived. Work day charges will then begin on a date mutually agreed upon, but not later than the delayed starting date specified. In the event that any contract is canceled after an award has been made but prior to the issuing of the Notice to Proceed, no reimbursement will be made for any expenses accrued relative to this contract during that period.

4.17 Steel Product

4.17.01 To comply with Indiana Code 5-16-8, affecting all contracts for the construction, reconstruction, alteration, repair, improvement or maintenance of public works, the following provision shall be added: If steel products are to be utilized or supplied in the performance of any contract or subcontractor, only domestic steel products shall be used. Should CITY feel that the cost of domestic steel is unreasonable, CITY will notify CONTRACTOR in writing of this fact.

4.17.02 Domestic Steel products are defined as follows:

"Products rolled, formed, shaped, drawn extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two (2) or more of such operations, from steel made in the United States by open hearth, basic oxygen, electric furnace, bessemer or other steel making process."

4.17.03 The United States is defined to include all territory subject to the jurisdiction of the United States.

4.17.04 CITY may not authorize or make any payment to CONTRACTOR unless CITY is satisfied that CONTRACTOR has fully complied with this provision.

Indiana Local Technical Assistance Program

This Agreement may be modified only by a written amendment signed by both parties hereto.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed the day and year first written above.

Department of Parks and Recreation

CONTRACTOR (Firm & Address)

BY:

BY:

Mick Renneisen, Director

Name _____ Date _____

Date: _____

Name Printed: _____

Title: _____

Date: _____

CITY OF BLOOMINGTON

BY:

Mark Kruzan, Mayor

CITY OF BLOOMINGTON Legal Department Reviewed By: _____ DATE: _____
--

PURDUE
ENGINEERING



INDIANA LTAP
(765) 494-2164
inltap@ecn.purdue.edu
www.purdue.edu/inltap