

Section 2: Tools for Creating and Implementing 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 departments. 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://AmericanTrails.org).

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.ⁱ

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 below) does not necessarily apply to trails in regions that do not receive as much sun or where wintery 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."ⁱⁱ 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.

Keeping variability in mind, the information in the following table ([Table 5](#)) 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: - 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.sjcfl.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."ⁱⁱⁱ 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 purchase a “Cadillac” standard of amenities wherever possible. Not only do high-grade, institutional-quality amenities have the best lifecycle costs, but spending more up-front is logical since it is easier to find money for construction than for maintenance.

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 the 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 installed asset and corresponding data including location, condition, manufacturer, and maintenance jurisdiction.

Figure 2. Snapshot: 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...”^{iv}

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.

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

ⁱ[INDOT, Pay Items](#)

ⁱⁱ[Engelmann, Preventive Maintenance](#)

ⁱⁱⁱ[St. John's County, p. 67](#)

^{iv}Domonkos, PASER, p. 4