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Best Management Practices for Controlling Exposure to Soil during the Development of Rail Trails

This document summarizes **Best Management Practices (“BMPs”)** that should be considered before, during, and after former railroad lines are converted to recreation trails. These BMPs have been developed to eliminate or minimize potential exposures to residual oil or hazardous materials commonly found along railroad rights-of-way being converted to rail trails. This document also identifies locations and conditions for which the application of BMPs alone may not be sufficiently protective of public health and the environment.

These BMPs have been developed specifically for situations where a municipality has acquired a property interest in a rail corridor from the Massachusetts Bay Transportation Authority (MBTA) in order to convert the corridor to a rail trail¹. This fact sheet is relevant to municipalities: (1) with specific knowledge of a release of oil or hazardous materials through testing or other means and/or (2) without specific knowledge of a release, that seek to prevent the exposure of persons to oil or hazardous materials that may be present in such corridor until a responsible person conducts response action under MGL Chapter 21E.

Background Information

The waxing and waning of railroad activity in Massachusetts over the past century has left the Commonwealth a legacy of under-utilized rights-of-way that may be redeveloped for new rail service (such as the Amtrak Downeaster and the Greenbush line) or recreational trails (such as the Minuteman Trail or the Mass Central Rail-Trail).

When active, these railroad lines were important transportation corridors serving the citizens and industries of Massachusetts. Now many communities are actively seeking to convert former railroad lines to create new links -- trails that link:

- commuter’s homes to workplaces;
- children’s schools to the playgrounds;
- tourists’ curiosity to the region’s history; and
- communities to their neighbors.

¹ More specifically, only for those situations addressed under Chapter 46 of the Acts of 2003

This information is available in alternate format. Call Debra Doherty, ADA Coordinator at 617-292-5565. TDD Service - 1-800-298-2207.

Many former rail lines were abandoned years ago and appear to be nearly reclaimed by nature. Other lines run parallel to active lines, or reveal rusted rails threading through industrial areas. In some instances adjacent industrial activities, historic loading practices, leaks during material transfers or storage, and repair activities have contaminated soil with oil or hazardous materials. In addition, residual contamination is often found along the length of the line, incidental to the maintenance and use of the railway itself.

Redevelopment of former rail lines to recreational trails can be accomplished in a way that protects public health and the environment. It requires recognizing potential problems and implementing actions to safeguard nearby residents, workers, and trail users throughout the life of the project.

Residual Contamination from Railroad Operations

Some historic railroad operations involved the use of chemicals that may have resulted in presence today of contamination. The most commonly reported contamination along rail lines includes metals, pesticides² (such as lead arsenate), and constituents of oil or fuel (petroleum products). These chemicals have been associated with normal railroad operations and are likely to be found anywhere along the line. For example, it would not be uncommon to find arsenic (up to ten times natural background levels) present in the soil along a right-of-way from old railroad ties dipped in an arsenic solution, arsenic weed-control sprays, and arsenic-laced slag used as railroad bed fill³. Lubricating oil and diesel that dripped from the trains are likely sources of the petroleum product found along the lines. Other sources of contaminants associated with historic railroad operation may include coal ash from engines, creosote from ties, and polynuclear aromatic hydrocarbons (“PAHs”) from the diesel exhaust.


The BMPs outlined in this document are specifically designed to be protective of public health and provide a practical alternative to extensively testing for and possibly removing these “typical” residues expected from the historic operation of a rail line⁴.

In some instances, a rail corridor may have been open for a relatively short time, during a period of time or in a region where chemicals were not used by the rail operator. Application of the BMPs would not provide any significant benefit in those instances. In the absence of good historic information, the only sure way to know whether residuals pose a risk to trail users is to collect environmental samples along the corridor. Location-specific sampling results may then be used to modify these measures or obviate the need for their use.

Elevated Contamination from Railroad Operations or Other Sources

Several potential sources of contamination along a rail line may pose significant health and environmental risks worthy of closer examination. These sources include operations at switching and repair yards, railroad accidents involving hazardous cargoes, and releases of chemicals on rail spurs and properties that abut rail lines, but which are unrelated to the railroad operations. The latter two examples may

² The application of pesticides consistent with their labeling is excluded from the definition of a “release” under M.G.L. Chapter 21E.

³ Sampling along the abandoned Greenbush Line in the Fall of 2003, prior to its rehabilitation for commuter rail service, indicates the presence of arsenic concentrations up to 205 mg/kg, with 16% of the results greater than the MCP S-1 soil standard of 30 mg/kg, and 25% greater than the *proposed* standard of 20 mg/kg. 

⁴ Consistent with Section 8C of Chapter 46 of the Acts of 2003 (<http://www.state.ma.us/legis/laws/seslaw03/sl030046.htm>), the BMPs described in this document suitably prevent access to the residual oil or hazardous materials expected to be present along a railroad right-of-way.

involve almost any chemical, such as the phosphorus trichloride released in an April 3, 1980, tank car incident in Somerville, or the asbestos released from the Zonolite processing plant in Easthampton. The contamination in rail yards is somewhat more predictable, including petroleum; metals; pesticides and organic compounds emanating from equipment cleaning areas; fueling areas; maintenance and repair activities; and the railroad beds themselves.

An MCP Phase 1⁵ level of investigation, tailored to the nature of the contaminant and source, would be appropriate to address these sources of elevated chemical contamination. A Phase 1 Preliminary Investigation would typically contain sufficient information in the following areas to determine the need for a Response Action or further detailed investigation:

- General Disposal Site Information (description of location and potential receptors in the area);
- Disposal Site Map (description of the property itself, with buildings, drains, and sampling locations noted);
- Disposal Site History (description of ownership, releases, chemical use, management of waste, compliance history);
- Site Hydrogeological Characteristics (description of groundwater flow, borings, wells, and the results of any investigations);
- Nature and Extent of Contamination (description of evidence of releases, laboratory results, thickness of NAPL, approximate location of contamination);
- Migration Pathways and Exposure Potential (description of contamination in air, water, soil, and discussion of potential human and environmental receptors);
- Evaluation for Immediate Response Actions; and
- Conclusions.

The results of such an investigation would be used to determine appropriate measures to implement to eliminate or reduce current and future exposure to the contaminated soils. Such measures could be similar to the BMPs proposed in this guidance, more extensive than these BMPs, or less stringent, depending on the outcome of the investigation.

Identifying Areas of Concern

As described above, locations along rail corridors could exhibit a wide range of chemical contamination, depending on the use of the line and adjacent properties. Trail developers can conduct historic research to categorize segments of a rail corridor by level of concern.

DEP has identified four categories of interest for the purpose of implementing the soil BMPs. Any given rail-trail may be comprised of one or more of these areas.

Residential, undeveloped or rural rights-of-way

These are stretches along a rail line that border historically residential, undeveloped or rural properties. These areas are likely to have been affected only by the normal operation of the rail line, with a residual level of contamination. The BMPs outlined in this document are considered appropriate for these locations, absent evidence of a specific release.

⁵ The general content of a Phase I “Initial Site Investigation Report” is described in the Massachusetts Contingency Plan, 310 CMR 40.0483.

Stations and crossings

These relatively small stretches along a right-of-way would be expected to be associated with contamination elevated over the residual levels, due to more frequent/intense use of pesticides to improve sight lines and greater frequency/intensity of human activities. The BMPs outlined in this document are considered appropriate for these locations, absent evidence of a specific release.

Industrial corridors

Many rail-trails include segments that pass through industrial areas, even the predominantly rural trails of western and central Massachusetts. These stretches have a higher *potential* for contamination within the right-of-way that is unrelated to the historic railroad use. The BMPs outlined in this document may not be sufficiently protective of public health and the environment at these locations. A preliminary review is recommended in order to establish whether site-specific concerns indicate a need for further investigation, including soil testing. Absent a site-specific concern, the BMPs outlined in this document are considered appropriate for these locations.

Switching and Repair Yards

As discussed earlier, switching and repair yards have a greater range of potential contaminants of concern and a higher likelihood that the contaminants are present at significant levels. The BMPs outlined in this document are not considered sufficient by themselves to protect public health and the environment at these locations, absent further investigation.

Figure 1 outlines the decision-making steps trail developers should follow in identifying locations of interest along the corridor they are developing and whether the BMPs apply without the need for further site investigation, including soil testing.

Goals of Best Management Practices

DEP's goals in publishing BMPs for use in developing rail-trails include:

- promoting rail-trail conversions that are both health-protective and cost-effective⁶;
- recognizing the potential presence of oil or hazardous material along the right-of-way;
- recognizing the potential health and environmental risks associated with developing the right-of-way;
- expediting trail development to prevent (or minimize) risk to current users of "beaten paths" along inactive rail corridors;
- preventing (or minimizing) exposures to oil or hazardous material before, during, and after construction of rail-trails; and
- preventing (or minimizing) off-site migration of contaminants before, during, and after the construction of rail-trails.

These BMPs are intended to be applied to those rail corridor segments where residual contamination from historic railroad operations is assumed to be present. Trail developers always have the option to conduct soil testing to rule-out the presence of contamination and tailor soil management practices to actual site conditions.

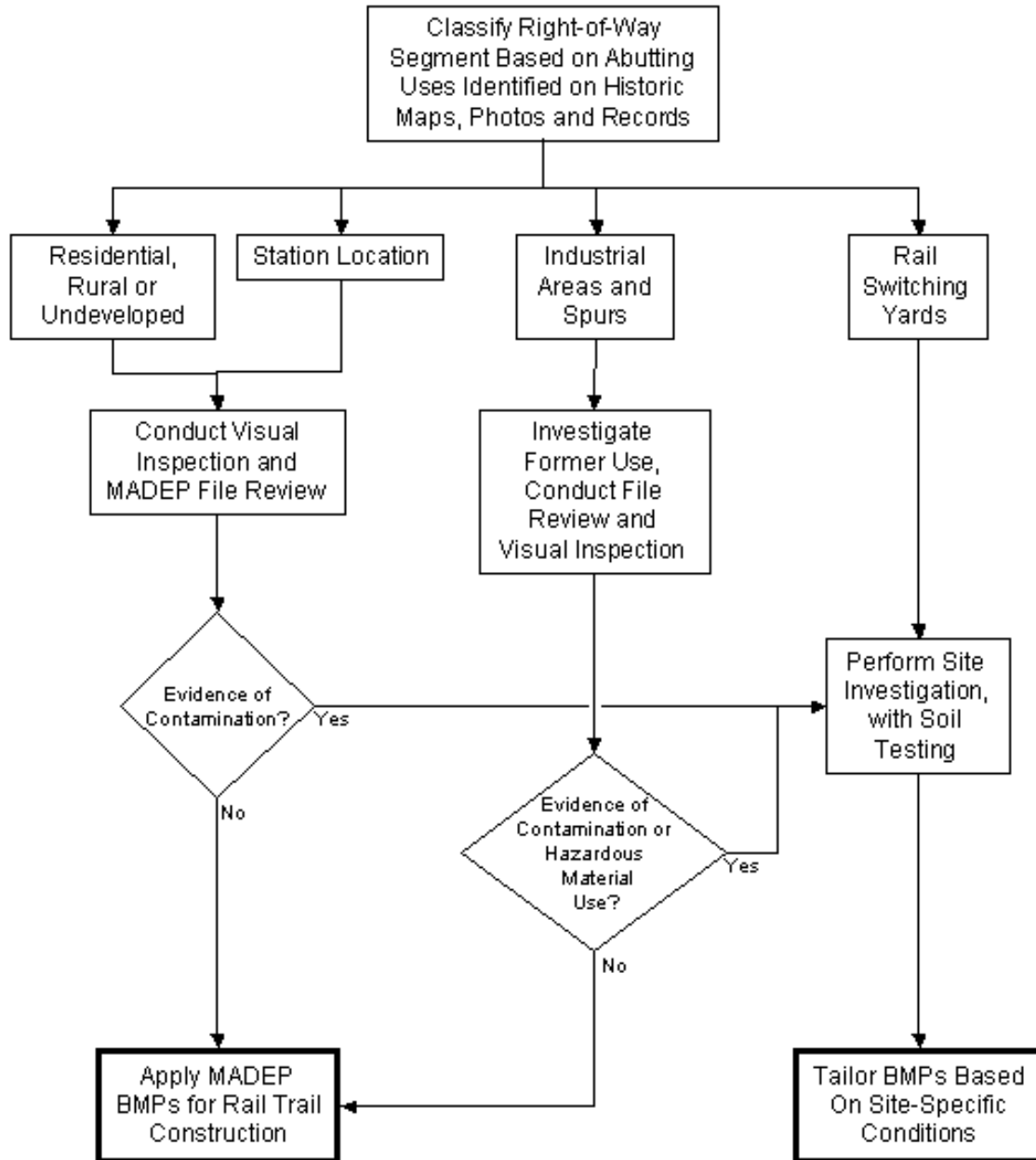
In addition to reducing risk of exposure to contaminants, the focus of this guidance, trails promote public health by encouraging active and healthy lifestyles.

The application of these BMPs to any portion of a rail corridor converted to residential use in conjunction with rail trail development is not appropriate. Only a site-specific investigation, including soil testing, can determine whether conversion to residential use is health protective.

Figure 1

Application of MADEP Best Management Practices at Rail Trail Conversions

(Pursuant to Section 8C of Chapter 46 of the Acts of 2003)



BMP Applicability

These BMPs were developed primarily for residential or rural rights-of-way, and stations and crossings. The BMPs will also be applicable in many industrial corridors, but those locations may need case-by-case review to determine the likelihood of contamination beyond the residual levels assumed here.

DEP does not believe that these BMPs are, by themselves, sufficient and appropriate for use without more extensive site investigation in industrial areas with known or likely non-railroad sources, or in rail yards.

Note that the focus of these BMPs is the potentially contaminated soil along the right-of-way and the human exposures and environmental exposures that may result from improperly managing that soil at or near the surface. This document is not intended to be a summary of all environmental requirements, such as wetlands permitting or Underground Storage Tank (UST) removal that may apply to a project. Municipalities developing rail trails are also obligated to contain the further release or threat of release of oil or hazardous materials from any structure or container within the corridor.

Phases of Project/Exposures of Concern

Rail-trail development occurs in three main phases, or time periods. Each phase has unique exposures that must be considered to identify appropriate BMPs. These phases are pre-construction, construction, and post-construction.

Pre-Construction Phase

The pre-construction phase covers the period up to the time construction actually begins. Depending on project finances and construction sequences, this phase may last several years as communities seek funds to develop a project. Trail design also occurs during the Pre-construction Phase.

While the right-of-way is not a designated rail-trail at this point, a potential may exist for people to be exposed to contaminated soil on or from the right-of-way. Dirt bikers, hikers, or children taking shortcuts, and adjacent residents may receive runoff or dust from the rail bed in its unimproved condition. Many future rail-trails also serve as utility corridors. Workers repairing or installing subsurface utilities (such as sewer lines) may have the highest potential for exposure, albeit short-term.

During trail design, developers should identify which soils will be handled during construction and plan the areas where people will congregate once the trail has been completed.

As the final grades are established, areas for playgrounds identified, and trailheads located, long-term exposures may be created to any contaminated soil remaining along the trail. By following the design guidelines provided below, designers can ensure that any long-term exposures are eliminated or minimized.

If any soil will be excavated from the right-of-way and reused off-site, the potential for exposure should also be considered.

Construction Phase

The construction phase has the potential to create significant exposures to contaminated soil as the old rail line is cleared, the right-of-way is prepared, and the trail is constructed. While construction activities may be sporadic and short-term on any given stretch of the line, the project itself may continue for many months, or even longer than a year.

The receptors of concern during the construction phase include:
demolition workers (clearing the brush; and removing the rails, ties, ballast, and debris);
construction workers (grading and shaping the trail; and creating, moving, and dissipating soil stockpiles);
adjacent residents (inhaling dust generated from the project; exploring the partially-built trail; coming in contact with soil pushed onto their property, etc...); and
environmentally sensitive areas/species.

Post –Construction Phase

After construction, trail managers must monitor activities along the trail corridor to ensure that the steps taken to reduce exposure remain effective. Trail managers should be involved in decisions to excavate material from the trail corridor to ensure that users are protected both during and after such excavation. Workers repairing or installing subsurface utilities (such as sewer lines) may have the highest potential for exposure, albeit short-term. Maintenance activities will be necessary to ensure the integrity of the trail surface, structures and landscaping that help serve to eliminate exposures.

Recommended BMPs

Absent analytical evidence to the contrary, all soil along the right-of-way should be presumed to have at least residual levels of lead, arsenic, and PAHs from historic railroad operations, as described above. The following BMPs should be considered for the pre-construction, construction, and post-construction phases of rail-trail development, as appropriate.

Pre-Construction

1. Conduct a thorough, pre-construction paper review of the right-of-way and adjacent properties.
 - Investigate the rail line history; locate old stations, crossings, spurs, and rail yards. The Valuation Plans and historic aerial photos for the properties abutting the rail line can provide much of this information⁷.
 - Investigate site use and the history of adjacent properties; identify commercial and industrial stretches. The Valuation Plans and Sanborn Insurance maps can provide much of the information for the snapshot in time when they were developed. Local historical societies may have information on leading local industrialists and their local businesses.
 - Review the existing list of known or suspected disposal sites to see if any are located along the right-of-way⁸

⁶Rails-to-Trails Conservancy provides additional guidance in its publication “Acquiring Rail Corridors” p 95-97. (http://www.trailsandgreenways.org/resources/development/acquis/arc_book.asp)

- Inquire with neighbors, fire department personnel or the local historical society for further information on train crashes, accidents, and other incidents that may have released chemicals.⁹
2. Conduct a thorough, visual inspection of the right-of-way, looking for:
 - contaminated soil as evidenced by discoloration, odors, differences in soil properties, pipes, or buried debris;
 - signs of illegal dumping of waste from businesses or industry (not simply household trash);
 - stressed vegetation or “dead zones”;
 - areas of soil run-off, both away from the right-of-way and toward the right-of-way;
 - signs of wind erosion sufficient to create a dust inhalation exposure;
 - signs of public use of the existing right-of-way (condoned or trespassing), such as dirt-bike trails, play forts, beverage cans, and fire pits.
 3. Control current (pre-construction) exposures to soil in areas of concern by implementing one or more of the following measures, as indicated by site conditions:
 - install signs to redirect people from areas of concern; or
 - strategically place barriers to control use in the areas of concern; or
 - implement other measures to eliminate contact with soils in areas of concern.

In the event these three measures do not prove successful, trail developers should consider covering areas of exposed soil or planting bushes (such as puckerbrush) to divert people away from areas of concern.

Design Guidelines to Reduce Exposure

While developing the design for the trail, the design engineer or architect should follow these guidelines in order to reduce potential exposures.

1. Within the tread way¹⁰ and in areas designated for recreational use along the trail (such as rest areas, picnic areas, and playgrounds), eliminate contact with potentially contaminated soil by implementing one or more measures, as appropriate:
 - Place potentially contaminated soil under pavement or an equivalent layer of compacted stone dust; or
 - Place potentially contaminated soil under at least 12 inches of clean fill and mark with a geosynthetic barrier immediately above the potentially contaminated soil; or
 - Remove and appropriately dispose of potentially contaminated soil off-site. Replace with clean material (soil, stone dust, wood chips, etc.) to establish the path and maintain grade.

⁷The Massachusetts DEP databases (<http://Mass.Gov/dep/bwsc/sites.htm>) have spills information from the early 1980’s and list known and suspected locations of contamination by street address. If evidence exists that an off-site source may have contaminated the right-of-way, further investigation is needed. DEP files may contain sufficient information to determine whether the right-of-way has been affected.

⁸If evidence exists that an incident may have contaminated the right-of-way, further investigation is indicated. DEP files may contain sufficient information to determine the extent of the problem.

⁹The tread way includes any area intended for active use including jogging side paths and equestrian trails

2. Outside of the tread way, control contact with potentially contaminated soil by implementing one or more measures to minimize or eliminate contact with potential residual contamination, including:
 - Design landscaping, including the nature, location, and density of plantings, that channels recreational users of the trail to the tread way, disrupts the creation of informal tread ways (such as single track trails) and directs users away from potentially contaminated soil;
 - Create areas of congregation, such as benches, rest areas, and scenic areas, that draw recreational users of the trail and encourage congregation away from potentially contaminated soil;
 - Install signs informing users of upcoming congregation areas and/or advising users to remain on the path;
 - Stabilize the soil through plantings, grading, or other erosion control measures;
 - Install guardrails, curbing, or fences in areas to encourage users to stay the tread way; or
 - Implement other design features that would minimize or eliminate contact with residual contamination in the soil.
3. The design should identify areas where potentially contaminated soil will be removed and areas within the corridor where such soils can be safely stored temporarily so that the Construction Contractors can re-use as much material on-site as possible.

During Construction

The following BMPs presume the trail construction includes excavation, movement, placement and grading of soil. Trail construction activities that involve no movement of soil may be carried out with the application of standard dust control measures, such as spraying soil with water.

The following guidelines should be followed during construction involving soil grading and excavation and be incorporated into the construction bid documents in order to ensure the proper handling of soils during trail construction:

1. Hire an independent environmental monitor or task existing staff to oversee the Construction Contractor¹¹. The monitor will:
 - Verify that construction-related plans and training are in place before construction begins ;
 - Oversee all excavation,
 - Visually inspect material that will be moved, and
 - Ensure proper management of soil along the right-of-way and the implementation of BMPs.

During construction, the environmental monitor should be present whenever known contaminated soil will be excavated and should inspect construction-related BMPs several times each week.

¹⁰For example, a municipality may enter into an agreement with Mass Highway to manage a trail construction funded with federal transportation appropriations. The agreement should require that the construction contract include provisions requiring the contractor to follow the BMPs and the directions of the independent environmental monitor.

2. Minimize or eliminate exposure of construction workers to potentially contaminated soil.
 - Prepare site-specific soil management and health and safety plans.
 - Have employees and subcontractors complete a safety-training program covering the potential hazards associated with working with contaminated soil likely to be present along a rail line, before excavation work begins.
 - Educate employees and subcontractors in identifying contaminated soil and on handling and disposal procedures for contaminated soil.
 - Hold regular meetings to discuss and reinforce the health and safety procedures.
 - Prevent visible dust during excavation, transportation, and placement operations. Implement dust control measures, such as spraying soil with water, during excavation or grading operations. Exercise caution to prevent soil spillage during transport.

3. Minimize or eliminate exposure of adjacent residents and curious trespassers to potentially contaminated soil.
 - Prevent visible dust during excavation, transportation, and placement operations. Implement dust control measures, such as spraying soil with water, during excavation or grading operations. Exercise caution to prevent soil spillage during transport.
 - Install temporary signs and/or security fence to surround and secure areas where potentially contaminated soil may pose an Imminent Hazard to human health.
 - Avoid temporary stockpiling of potentially contaminated soils. Take the following precautions stockpiling, as necessary:
 - Identify long-term stockpile locations that are away from residences, schools or playgrounds;
 - Cover the stockpile with plastic sheeting or tarps to prevent dust generation and erosion;
 - Install a berm, hay bales, and/or silt fences around the stockpile to prevent runoff from leaving the area;
 - Do not stockpile in or near storm drains or watercourses; and
 - Clean-up materials should be staged near the storage area.

4. Minimize or eliminate the migration of potentially contaminated soil off-site.
 - Protect gutters, storm drains, catch basins, and other drainage system features on the site with hay bales and/or silt fences during construction. They should be cleaned following the completion of site work.
 - Prevent visible dust during excavation, transportation, and placement operations. Implement dust control measures, such as spraying soil with water, during excavation or grading operations.
 - Exercise caution to prevent soil spillage during transport.
 - Stabilize exposed areas of potentially contaminated soil and prevent run-off.

5. Prevent new leaks and spills and notify DEP, as appropriate, if they occur.

6. Transport and dispose potentially contaminated soil in accordance with the applicable rules and regulations of the United States Department of Transportation (USDOT), the United States Environmental Protection Agency (USEPA), and the Massachusetts Department of Environmental Protection (MADEP) (the specifications for the off-site management of contaminated soil supersede the procedures outlined in this BMP).

Post- Construction

1. Establish a protocol to ensure that future workers performing maintenance or construction within the right-of-way are made aware of the need for appropriate BMPs, including:
 - Posting of signage indicating that a permit from the trail manager is necessary before any excavation of the corridor begins.
 - Sending notice of the existence of such requirement to easement holders and the municipal engineer and/or public works department; and
 - Developing Standard Operating Procedures with local utilities, easement holders, DPWs, and other municipal offices for work in the right-of-way.
2. Establish a procedure for the trail manager to periodically travel the corridor and inspect the integrity of the trail surface, structures and landscaping and require appropriate action to correct any problems observed.

DEP Contact

For further information, please contact Paul Locke in the DEP Bureau of Waste Site Cleanup at (617) 556-1160 or Paul.Locke@state.ma.us.