# Stormwater Best Management Practice

# Dust Control

**Minimum Measure:** Construction Site Stormwater Runoff Control
**Subcategory:** Erosion Control

## Description

Dust control practices reduce the potential for construction activities to generate dust from disturbed soil surfaces. Construction sites can have large areas of soil disturbance and open space from which wind can pick up dust particles. Airborne particles pose a dual threat to the environment and human health. Dust that the wind carries off-site can impact nearby waterbodies due to direct deposition or transport by stormwater. In addition, dust from construction sites increases the levels of particle air pollution, also called particulate matter (PM), in the form of $PM_{2.5}$ (fine inhalable particles with diameters generally 2.5 micrometers and smaller) and $PM_{10}$ (inhalable particles with diameters that are generally 10 micrometers and smaller) in surrounding areas (Azarmi et al., 2016; Muleski et al., 2005), which can contribute to respiratory health problems and create inhospitable working environments.

## Applicability

Dust control measures apply to any construction site where major soil disturbances or heavy equipment construction activities—such as clearing, excavation, demolition or excessive vehicle traffic—occur. Earthmoving activities, particularly transport of cut and fill materials, are the major source of dust from construction sites (Muleski et al., 2005), but traffic and general disturbances can also be significant contributors (WA Dept. of Ecology, 1992). Dust control measures are especially important in arid or semiarid regions, where soil can become extremely dry and vulnerable to transport by high winds. The most effective dust control measures for a site depend on its topography and land cover, soil characteristics, and expected rainfall.

## Siting and Design Considerations

The quantity of dust generation and transport depends on the amount of exposed soil. Therefore, when designing a dust control plan, design engineers and construction staff can greatly reduce dust generation by sequencing activities in a way that disturbs only small areas at a time. Construction staff responsible for dust control should determine which practices accommodate their needs according to specific site and weather conditions. The following is a brief list of example control measures and design criteria:

A truck equipped with a spray system can spray water throughout a construction site and prevent dust from being transported off-site.

- *Sprinkling/irrigation.* Sprinkling the ground surface with water until it is moist is an effective dust control method for most sites, particularly on haul roads and other traffic routes where other dust control methods may not be possible.
- *Vegetative cover.* In areas that construction staff do not designate for vehicle traffic, vegetative cover reduces wind velocity at the ground surface, thus reducing the potential for dust to become airborne.
- *Mulch.* Mulching can be a quick and effective dust control method for a recently disturbed area.
- *Wind breaks.* Wind breaks are barriers (either natural or constructed) that reduce the velocity of wind through a site, thereby reducing the number of particles the wind suspends. Wind breaks can be trees or shrubs that construction staff leave in place during site clearing or constructed barriers such as wind fences, snow fences, tarp curtains, hay bales, crate walls or sediment walls.



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- *Tillage.* Deep tillage in large open areas brings soil clods to the surface where they rest on top of dust, preventing it from becoming airborne.
- *Stone.* Stone can be an effective dust deterrent for construction roads and entrances or serve as mulch in areas that cannot establish vegetation.
- *Chemical soil stabilization (palliatives).* There are several different categories of chemical soil treatments: water absorbing, organic non-petroleum, organic petroleum, synthetic polymer emulsion, concentrated liquid stabilizer and clay additive (Jones, 2017). Factors to consider when selecting a chemical application for dust suppression include biodegradability, soil suitability, and impacts to wildlife and environmentally sensitive areas.

## Limitations

Applying water to exposed soils can be time-intensive and—if done to excess—could result in discharge from the site or vehicles tracking mud onto public roads. Excessive use of water can also be inappropriate in water-scarce regions. Misuse of chemical applications can create hazardous working conditions, increase surface water pollution from discharges or contaminate groundwater. Excessive use of chemical applications might also present a health risk.

## Maintenance Considerations

Inspection and maintenance requirements are unique for each site because dust controls depend on specific methods, site conditions and weather conditions. Generally, dust control measures involving the application of either water or chemicals require more monitoring than structural or vegetative controls to remain effective. Construction staff should consult manufacturer specifications for chemical stabilizers. If the site uses structural controls, regular inspection and maintenance are necessary to ensure that the controls remain effective.

## Effectiveness

- *Mulch.* Mulch can reduce wind erosion by 75 to 95 percent compared to unstabilized soils, depending on the type of mulch and the application rate (MPCA, 2019). Mulch is effective on sites that will re-establish vegetation and in areas where slopes have less than 1 foot of elevation change for every 2.5 feet of horizontal change. Mulch can be effective in areas with steep slopes in combination with tackifiers or other stabilization methods.
- *Sprinkling/irrigation.* Water is one of the most common ways to control dust on a construction site. It is effective in heavily trafficked areas, such as construction roads where other methods are not feasible. However, water requires frequent reapplications to remain effective.
- *Wind breaks.* The effectiveness of wind breaks depends primarily on their size and permeability. As a general rule, for each foot of vertical height, an 8- to 10-foot deposition zone develops on the leeward side of the barrier. Highly permeable barriers are less effective than more impermeable barriers.
- *Stone.* Gravel can reduce soil losses by 95 percent compared to unstabilized soils (MPCA, 2019).
- *Spray-on chemical soil treatments (palliatives).* The effectiveness of polymer stabilization methods is highly variable and depends on site characteristics, climate and the specific chemical soil treatment. Sites should follow manufacturer specifications to achieve maximum effectiveness.

## Cost Considerations

Costs for chemical dust control measures can vary widely depending on the specific needs of the site and the desired level of dust control. Water requires significantly more frequent reapplication than chemical stabilizers, as well as specialized machinery. Therefore, while water itself is inexpensive, costs associated with using water for dust control may be significantly higher than other methods (Jones, 2017). Chemical soil treatments typically only require seasonal or annual application, thus resulting in potential labor and equipment cost savings. However, depending on the type of chemical, the substance may require special storage and application equipment. Once established, vegetation can be more cost-effective for long-term stabilization.

## Additional Resources

- Maryland Department of the Environment. (2011). 2011 *Maryland standards and specifications for soil erosion and sediment control*.
- Montana Department of Transportation. (2015). *Erosion and sediment control best management practices manual*.
- Ohio Department of Natural Resources. (2014). *Rainwater and land development—Ohio's standards for stormwater management, land development and urban stream protection* (3rd ed.).
- City of Portland Oregon. (2008). *Erosion and sediment control manual*.
- Washington State Department of Transportation. (2019). *Temporary erosion and sediment control manual*.

**Additional Information**

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

## References

Azarmi, F., Kumar, P., Marsh, D., & Fuller, G. (2016). Assessment of the long-term impacts of $PM_{10}$ and $PM_{2.5}$ particles from construction works on surrounding areas. *Environmental Science: Processes & Impacts*, *18*(2), 208–221.

Jones, D. (2017). *Guidelines for the selection, specification and application of chemical dust control and stabilization treatments on unpaved roads*. University of California Pavement Research Center.

Minnesota Pollution Control Agency (MPCA). (2019). Erosion prevention practices—natural and synthetic mulches. In *Minnesota stormwater manual*.

Muleski, G. E., Cowherd, C., & Kinsey, J. S. (2005). Particulate emissions from construction activities. *Journal of Air & Waste Management Association*, *55*(6), 772–783.

Washington State Department of Ecology (WA Dept. of Ecology). (1992). *Stormwater management manual for the Puget Sound basin*.

**Disclaimer**

*This fact sheet is intended to be used for informational purposes only. These examples and references are not intended to be comprehensive and do not preclude the use of other technically sound practices. State or local requirements may apply.*