

Appendix 5: List of Potential Dust Palliatives

1 APPENDIX 5: LIST OF POTENTIAL DUST PALLIATIVES

Road Palliation Options (Efficiencies from Bashian and Strauss, 2002)				
Type (efficiency %)	Mechanism	Advantages	Limitations	Environmental considerations
Freshwater (87%)	Moisture wets particles, increasing their mass and binding them together.	Usually readily available, low material cost, easy to apply.	BRMO within a water scarce area. Frequent light applications may be necessary during hot, dry, weather; potentially labour intensive. Over application may result in loss of traction, erosion, or points of road failure.	Minimal environmental impact provided water is not scarce. If applied excessively, may result in erosion and sediment runoff. Supply may be limited in some areas.
Calcium chloride	Deliquescent and hygroscopic at a relative humidity equal to or greater than 29 % (25°C).	Reduces evaporation rate of surface moisture 3.4 times; increases compacted density of road material.	Effectiveness in arid and semi-arid regions may be limited due to low relative humidity; very corrosive to aluminium alloys; slightly corrosive to steel. Solubility results in leaching during heavy precipitation. Releases heat when mixed in water.	Repeated applications and long-term use may harm vegetation, and contamination of groundwater.
Magnesium chloride (98%)	Deliquescent and hygroscopic at a relative humidity equal to or greater than 29 % (25°C).	Reduces evaporation rate of surface moisture 3.1 times; increases compacted density of road material, more so than CaCl ₂ .	Effectiveness in arid and semi-arid regions may be limited due to low relative humidity; very corrosive to steel, though inhibitors can be added. Solubility results in leaching during heavy precipitation.	Repeated applications and long-term use may harm vegetation, and contamination of groundwater.
Lignin derivatives (99%)	Act as adhesives, binding soil particles together.	Greatly increases dry strength of soil; not humidity-dependent; imparts some plasticity to road surfaces; lowers freezing point of road surface and	High solubility results in leaching during heavy precipitation; corrosive to aluminium alloys due to acidity (CaCO ₃ added ingredient, can neutralize acidity). Proper aggregate mix (4-8% fines) important to performance. Becomes slippery when wet, brittle	Lignin products have a high BOD in aquatic systems. Spills or runoff into surface or groundwater may create low dissolved oxygen conditions or increases in groundwater concentrations of iron,

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		base.	when dry.	sulphur compounds, and other pollutants.
Tree Resin Emulsions	Act as adhesives, binding soil particles together.	Low solubility after curing minimizes leaching and provides degree of surface waterproofing. Imparts some plasticity to road surfaces. High bonding strength; non-corrosive.	Require proper weather and time to cure. No residual effectiveness after re-blading. Equipment requires prompt clean up avoiding curing of resin in hoses and pipes.	
Synthetic Polymer Emulsions	Bind soil particles together by forming a polymerizing matrix, function similar to adhesives.	Applicable to a range of emission sources; function well in sandy soil conditions. Some types allow seeded vegetation to grow through the polymer matrix.	Require proper weather conditions and time to cure; may be subject to UV (sunlight) degradation; application equipment requires timely cleaning; no residual effectiveness after re-blading.	
Bituments, Tars, and Resins	Asphalt and resinous products are adhesive, binding soil particles together. Petroleum oil products coat soil particles, increasing their mass.	Water insoluble when dry; provide a degree of surface waterproofing. Good residual effectiveness.	Surface crusting, fracturing and potholing may develop; long-term application may cause road to become too hard for re-blading; won't lower freezing point; petroleum oil products lack adhesive characteristics.	Use of used oils is prohibited. See MTCA discussion on page 6. Some petroleum-based products may contain carcinogenic polycyclic aromatic hydrocarbons (PAHs).
Geo-textiles	Provide and maintain drainage; improve load supporting properties; prevent	Flexible, durable, water permeable, and resists soil chemicals; reduces	High material cost; material degrades in sunlight, if exposed.	

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	upward migration of sub-grade fines; separate road layer materials.	amount of aggregate required during initial construction; lower maintenance.		