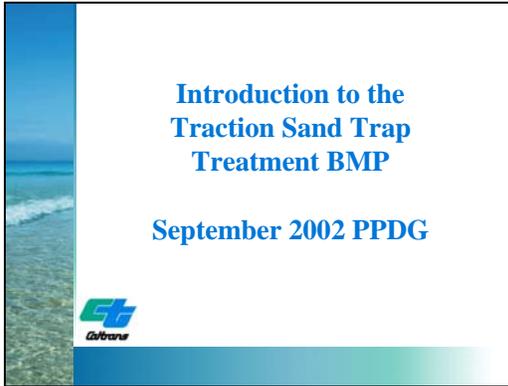


Treatment BMP Training – “Introduction to Traction Sand Traps”  
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**Slide 1:** In this module we will review the Traction Sand Trap Treatment BMPs (TSTs).

**Traction Sand Trap**

**Description**

- **Permanent Treatment BMP device that temporarily detains runoff to allow suspended traction agents solids to settle out.**

**Slide 2:** Traction sand traps are permanent treatment devices that temporarily detain sediment-laden runoff from snowy or icy roads on which Maintenance had placed traction sand; during that detention period the larger solids will settle out, thereby reducing the sediment-laden discharge to downstream receiving waters. “Traction sand” can refer to sand, cinders, and other abrasives. Traction Sand Traps may take the form of basins, tanks, or vaults. A traction sand trap may be a stand-alone device, or may be incorporated as part of another storm water facility such as a detention basin. Later slides will describe the main types of TSTs.

**Traction Sand Trap**

**Treatment Mechanisms**

**Treatment by:**

- **Sedimentation**
- **Infiltration**

**Slide 3:** These are the treatment mechanisms for TSTs, with infiltration occurring but due to the limited volume of runoff that is held the TST is not considered as a full Infiltration Device Treatment BMP.

**Traction Sand Trap**

**Pollutants Treated**

	Biofiltration Systems		Traction Sand Traps		Traction Sand Traps
Total Suspended Solids		Total Suspended Solids	✓		
Nutrients	✓	Nutrients			
Pesticides		Pesticides			✓
Particulate Metals		Particulate Metals			
Dissolved Metals	✓	Dissolved Metals			
Pathogens		Pathogens			
Litter	✓	Litter			
Biochemical Oxygen Demand		Biochemical Oxygen Demand			
Total Dissolved Solids		Total Dissolved Solids			

PPDG Table 2-2, Page 2-7

**Slide 4:** The TSTs are less efficient at removing finer sediments (silts and clays) than the larger sediments.

**Traction Sand Trap**

**Types**

- **Vault**
- **Modified CMP Riser**
- **Detention Basins**
- **Forebay upstream of an Infiltration Basins**

**Slide 5:** These are the four styles of TSTs.

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**Traction Sand Trap**

**Vault Style**

- Below grade structure placed in-line or off-line in storm drain systems.
- Vault has sedimentation chamber to slow flow velocities and settle sand, with sufficient freeboard to bypass elevated peak flows.
- Good for sites with large traction sand volumes and limited space.

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**Slide 6:** TSTs may be configured as a vault, which is an underground concrete structure designed with a sedimentation chamber and peak flow diversion. Some additional comments about Vault Style TSTs.

- Below grade structure placed in-line or off-line in storm drain systems.
- Vault has two chambers, with the 1<sup>st</sup> being sedimentation chamber to slow flow velocities and allow some settlement. This style must have sufficient freeboard to bypass or carry through the peak flows.
- Good for sites with large traction sand volumes and limited space.

The vault style TST is one of the two most popular TST styles at this time.

**Traction Sand Trap**

**Vault Style TSTs**

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**Slide 7:** This generic vault style is currently being piloted by Headquarters and District 3 for on Brockway Summit (Rt. 267, Lake Tahoe).

**Traction Sand Trap**

**Vault Style TSTs**

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**Slide 8:** This vault is another version of TST that is under consideration by Headquarters and District 3 for a pilot study on Brockway Summit.

**Traction Sand Trap**

**Modified CMP Style**

- Below grade structure that uses commercially available corrugated metal pipe (CMP) placed vertically with an outflow pipe offset from the invert of the trap to capture sand
- Sites with small traction sand volumes and limited space are most suitable for modified CMP traps

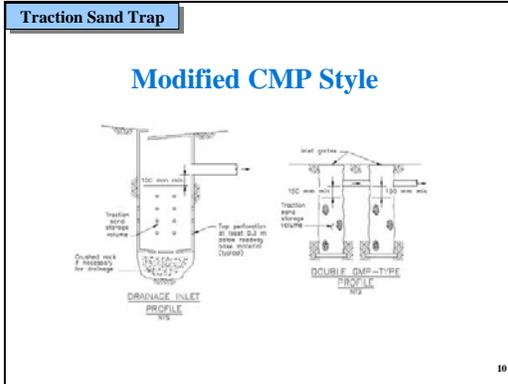
9

**Slide 9:** This is also a very popular style of TST: The Modified CMP Riser is an underground vertical CMP that captures traction sand below the invert of the outlet pipe (the outlet pipe invert is above the invert of the vertical CMP, as will be seen on the next slide).

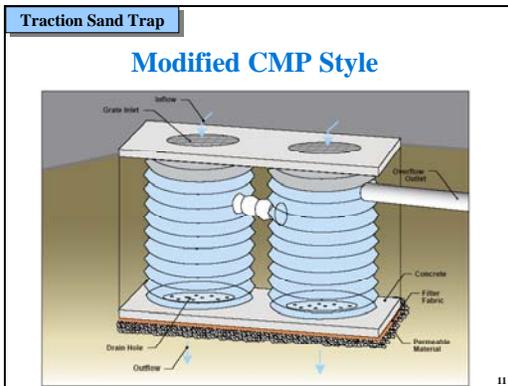
The CMP (Corrugated Metal Pipe) Riser is appropriate for small traction sand volumes. Typical modifications include increasing the depth of the inlet so that there is a settling/storage area below the invert of the outlet pipe, linking multiple inlets for increased storage volume, and weep holes to allow the storage volume to drain. Since water will infiltrate from the device, the local RWQCB should be consulted regarding its proposed placement.

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The CMP Riser style TST is the other of the two most popular TST styles at this time.



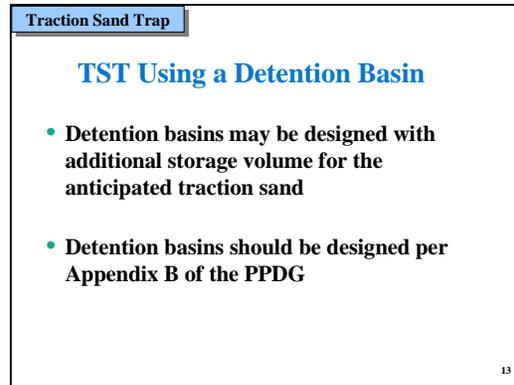
**Slide 10:** Typically, the Modified CMP Riser is basically a drop inlet whose below-ground portion has been modified to capture and retain traction sand; modifications include increasing the depth of the inlet so that there is a settling/storage area below the invert of the outlet pipe, linking multiple inlets for increased storage volume, and adding weep holes to allow the storage volume to drain.



**Slide 11:** This is a schematic of a double barrel CMP style.



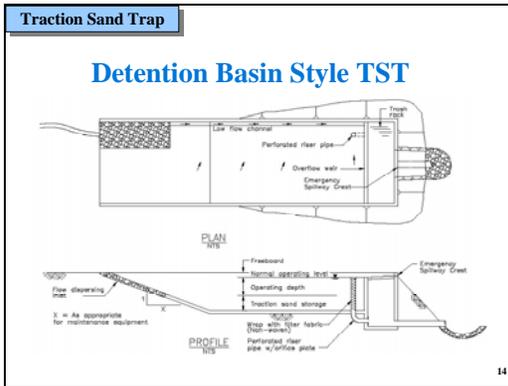
**Slide 12:** This is a double barrel CMP style shown in the field.



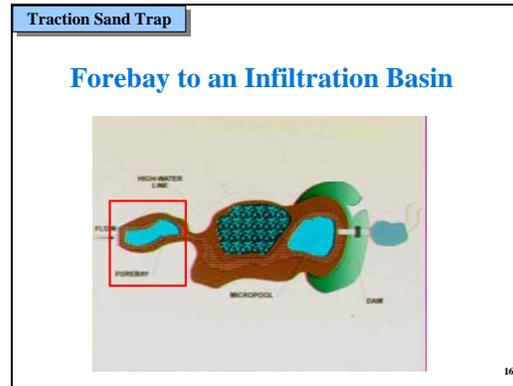
**Slide 13:** Detention Basin: Detention basins may be sized to accommodate additional traction sand loading. They should be considered as the first choice for the TST, but siting can be difficult where terrain is steep and/or right of way is limited.

Detention basins should be designed per Appendix B.4 of the PPDG with extra volume in the Basin above the WQV to account for the expected annual traction sand loading.

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**Slide 14:** This is a style of a detention basin, having concrete invert and sides, nicknamed the “loading dock”; designs are being developed by HQ Office of Storm Water Management.



**Slide 16:** The TST forebay is highlighted by the red box on the left side of the slide.

- As Pre-treatment to Infiltration Basin**
- Infiltration basins in areas where traction sand is applied must be designed with a sedimentation forebay
  - Sedimentation forebay is sized to retain the traction sand volume and the sediment load associated with site conditions (sediment loads not associated with winter activities)

**Slide 15:** A Forebay to an Infiltration Device: Forebays just upstream of an Infiltration Treatment BMPs can be placed to capture sediment prior to discharging into the Infiltration device. If placed in a non-snowy areas, this would not be considered as a stand-alone Treatment TST. See Appendix B, Section B.3 of the PPDG for additional discussion.

- Siting and Design Criteria**
- Sites where traction substances are commonly applied to the roadway.
  - Detention Basins for WQV and sand should be the first choice, then other devices.
  - Consult District NPDES Storm Water Coordinator to ensure that the CMP or Vault types are not classified and regulated as a underground injection well.
  - Locate device so water is not introduced above the roadway subgrade in case of blockage.

**Slide 17:** Consider where traction sand is placed more than 2x a year on a regular basis. Regarding the last bullet: as a rule of thumb, Locate device so water is not introduced above the roadway subgrade in case of blockage. The 3<sup>rd</sup> bullet references the discussion that should occur if CMP Risers are used.

It can be assumed in the absence of more definitive studies that the ‘wetting front’ from the base of an open culvert is 2V:1H; if that pattern does not intercept within 5 ft of the pavement structural section, this condition is met.

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**Traction Sand Trap**

**Preliminary Design Factors**

- Design for anticipated sand recovery volume.
- Minimize the area of unstabilized slopes in the tributary area so reduce outside contribution to the Traction Sand Trap
- **Divert** peak hydraulic flow , if practical
- Provide a sufficient volume to store the settled sand between scheduled cleanout.
- Provide if possible clearance of minimum of 0.5 ft between the top of the temporary storage volume and outlet pipe a between top of sand

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**Slide 18:** Typical siting measures include locating inlets only on the down-gradient side of the roadway, locating the top inlet drainage hole below the roadway subgrade, and providing additional drainage pathways (such as a leach line) to guide water away from the subgrade. Locating traction sand inlets on the high side of a superelevated section should be avoided. Provisions should be made to divert the peak hydraulic flow (calculated according to Caltrans procedures for flood routing and scour).

Flow velocities should be minimized to initiate settling. Typically, velocities lower than 2 feet per second (0.61 m/s) promote settling; this is a good engineering criteria. Note that “Divert Peak Flow” is indicated in the PPDG. This is not always possible, in which case ‘conveying’ the peak HDM Design Storm flow will be required.

The storage area should start at least 6 inches (0.15 m) below the invert of the inlet’s outlet pipe and extend no more than 3 m below the inlet grate (or road surface). If the inlet is any deeper than that, a Vactor truck will have difficulty removing the traction sand from the bottom of the basin.

**Traction Sand Trap**

**Preliminary Design Factors**

- Provide for gravity flow.
- Provide inlet/outlet to minimize short-circuiting of the flow
- Provide weep holes or other water outlets to allow proper drainage
- Provide an invert 1 to 2 m (3 to 6 ft) above groundwater if drainage is allowed through base.

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**Slide 19:** Additionally, the bottom of the inlet should be at least a few meters above the ground water table. If the required storage volume cannot be met under these criteria, consider using double inlets or non-standard inlets, adding more inlets, using a different treatment control, or supplementing the traction sand inlets with additional downstream controls.

**Traction Sand Trap**

**Preliminary Design Factors (cont’d.)**

- Provide Maintenance adequate access for cleanout
- Provide an invert at depth no greater than 3 meters below OG (vault or CMP riser styles for vacuum clean-out).
- Flow velocities within the trap should be minimized particle resuspension

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**Slide 20:** For the CMP Riser design, the design infiltration rate should be limited to 50 percent of that indicated in the soils report (if conducted). This provides a factor of safety and allows for accumulation of fines that, over time, will reduce the infiltration rate. If the surrounding soils do not provide sufficient permeability to draw down the inlet within 48 hours, it may be necessary to select a different treatment control.

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Traction Sand Trap

### Other Design Factors

- If the design storage volume cannot be met with one trap device then additional storage can be obtained by:
  - adding more traps in-line
  - increasing frequency of clean-out
  - discuss other options with District Maintenance and Storm Water Coordinator.

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**Slide 21:** Refer to text on the slide.

Traction Sand Trap

### Cleanout Using Vacuum Trucks



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**Slide 23:** If the inlet is any deeper than about 3 m a vacuum ("Vactor" is one brand name) truck will have difficulty removing the traction sand from the bottom of the basin.

Traction Sand Trap

### Cleanout Using Vacuum Trucks



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**Slide 22:** The clean-out of TSTs, other than the basin style devices, will be done using vacuum trucks. Providing a pullout area for the vacuum truck not only provides an additional measure of safety for the cleaning crew, but may also save time and money by avoiding lane closures. At a minimum, the pullout area should be about 10 m long and 3 m wide and be located so the inlet is near the front of the truck. Consult with District Maintenance staff to see if inlet location markers are required. See Standard Plans for maintenance vehicle pull out.

### Introduction to the Traction Sand Trap Treatment BMP

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### Questions?



**Slide 24:** End of the presentation.