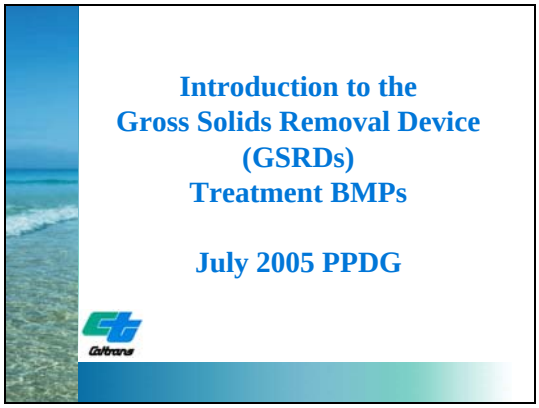
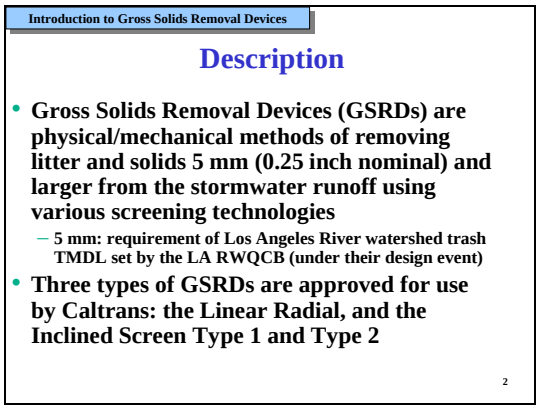


Slide 1: GSRDs, Gross Solids Removal Devices, are one of the nine approved Treatment BMPs that can be employed on a Caltrans project. In addition to the information presented today, Appendix B of the PPDG (Project Planning and Design Guide) has a six-page section on the GSRD. Please check with the upcoming revision of the PPDG to determine if there are any changes to the material we will review today.

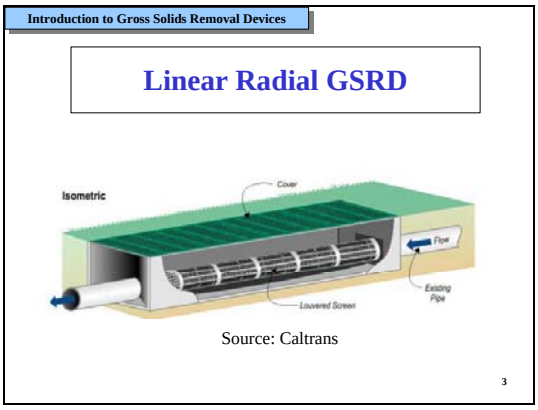
Please contact your NPDES Coordinator if you have questions that were not answered today, or call the Headquarters Design Office of Storm Water Management.

Currently, the plan sheets for the GSRDs are not found in the Standard Plans, but they are available from HQ Office of Storm Water Management.



Slide 2: Gross Solids Removal Devices (GSRDs) are physical/mechanical methods of removing litter and solids 5 mm (0.20 inch nominal) and larger from the stormwater runoff using various screening technologies. A 5 mm litter size is the requirement of Los Angeles River watershed trash TMDL set by the LA RWQCB; under their design event, a 1-year, 1 hour event – litter transported by more intense events may bypass the system without violating the TMDL; however, at this time it is Caltrans policy to capture rainfall events up to the 'Highway Design Manual' event, refer to HDM Topic 830 for a definition of the HDM event, or consult with District Hydraulics.

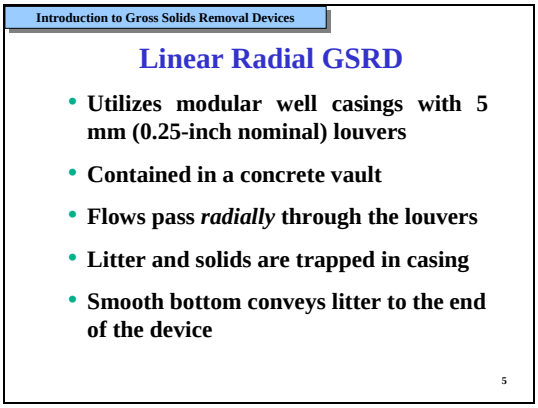
Three types of GSRDs are approved for use by Caltrans: the Linear Radial, and the Inclined Screen Type 1 and Type 2



Slide 3: This slide shows a schematic of the Linear Radial GSRD. While no overflow is shown on this schematic, an overflow will always be placed as part of the screen lengths, as will be seen on an upcoming slide; its location is just inside the vault, at the upstream end of the well screen. Without an overflow, the street could be flooded if the device clogs. The screens are identical to water well screens, except that, in end view, the bottom 60 degrees does not have louvers; this is so that the water and litter will be carried without friction to the

downstream end of the screen length, to the left of the figure on this view, where it is stored until later clean-out. Litter-bearing stormwater runoff enters the screens from the right on this figure, and clean water leaves through the louvered openings; once the water leaves the screen, it drops to the floor of this vault, and exits the vault from a pipe which is at invert elevation, shown on the left on this figure. The screens come in 5-ft long sections.

Slide 4: The well screens are fabricated with a hinged opening, so that the well screen opens just above the midpoint of the screen (end view) so that removal of litter can be more easily accomplished. Removal of the litter is done using a vacuum truck.



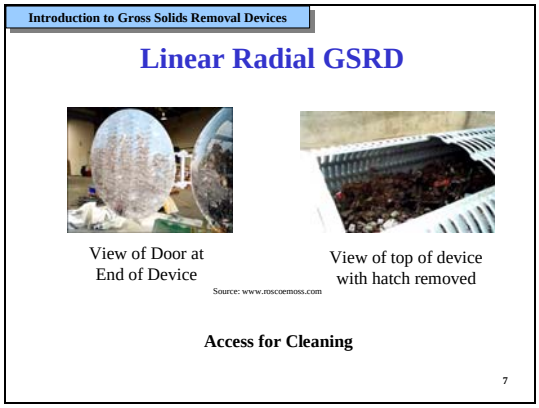
Slide 5:
We discussed these features on the previous slides, and in the next several slides.
•Utilizes modular well casings with 5 mm (0.20-inch nominal) louvers
•Contained in a concrete vault
•Flows pass radially through the louvers
•Litter and solids are trapped in casing
•Smooth bottom conveys litter to the end of the device

Slide 6:
In this picture, flow is toward the viewer.
A few other comments about the details of the Linear Radial GSRD:
•Louvers face away from direction of flow to reduce clogging.
•The number of well screen sections is sized primarily for the expected annual litter loading, but the Highway Design Manual rainfall event also is used to

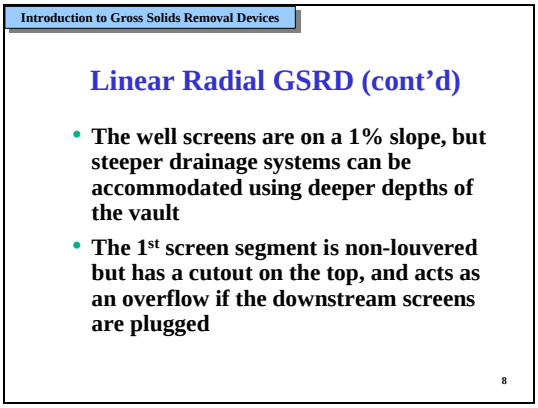
determine the number of screens (unless the GSRD is designed for off-line placement).

•During rainfall, clean water exists the screen through the louvers while the litter is retained in the interior volume of the screen.

•An overflow device can be seen (barely) on the photo on the left on the uppermost part of the screen segment – a cut out from the top of the well screen is evident; should the LR GSRD become plugged or outflow sufficiently impaired, influent will rise out of the cut off and spill onto the vault's floor.



Slide 7: A hinged opening on the top of the well screen modules allows access to the captured litter, for annual removal. Note also that there is a door on the end of the length of screens, again related to clean-out purposes.

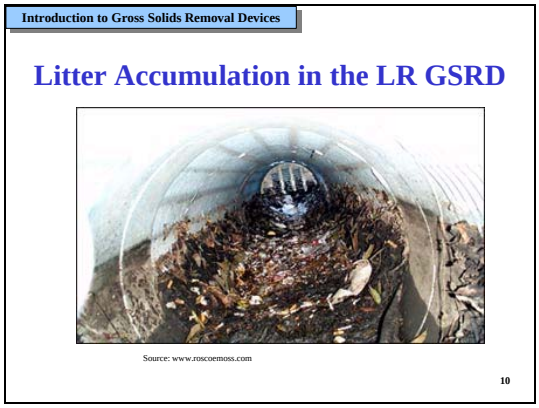


Slide 8:

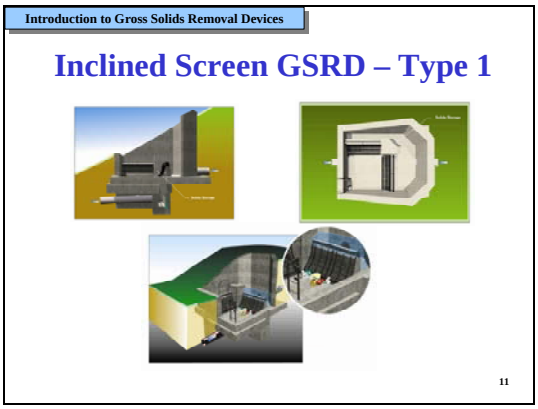
•The well screens are on a 1% slope, but steeper drainage systems can be accommodated using deeper depths of the vault; for example, the minimum difference in elevation of the inflow/outflow pipe inverts for an (outside length) of the vault of 14 ½ ft is 0.38 ft, but the maximum would be 4.79 ft. Refer to page 7 of the Linear Radial GSRD plan sheets available from the HQ Office of Storm Water Management.

•The 1st screen segment is non-louvered but has a cutout on the top, and acts as an overflow if the downstream screens are plugged. This segment is 2 ft 10 inches in length.

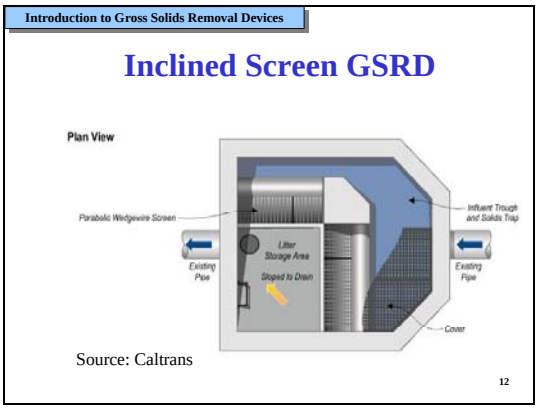
Slide 9: This Linear Radial is in the shoulder area of Interstate 10 in Los Angeles County. If placement is proposed within a Clear Recovery Zone, use of guardrail to protect the traveling public will likely be required, consult with District Traffic Operations.



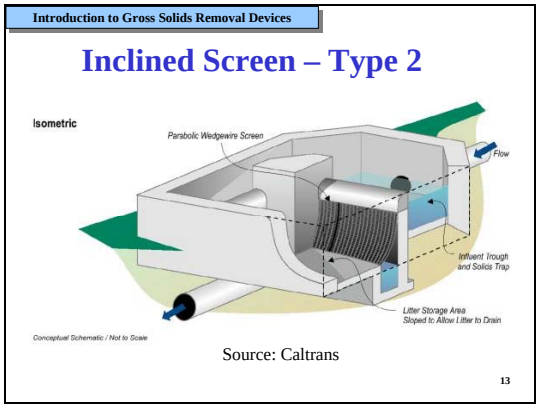
Slide 10: This is an interior view of the LR GSRD, looking downstream, toward the closed end. Note that the water line is approximately at the spring line. As the litter is accumulated, it blocks progressively more of the louvers, and water must rise higher in the device to exit, and from the well screens upstream. The design philosophy is for litter to accumulate fully in the downstream louvered well screens (1/2 of the total placed), and thus stormwater would only exit from the upstream screens at the end of the one year accumulation period.



Slide 11: This is a schematic of the Type 1 Inclined Screen GSRD.

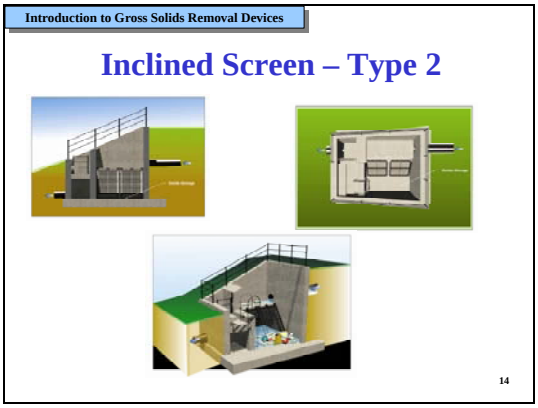


Slide 12: A 'floor' drain in the influent trough section empties the trough at the end of the storm event. Some litter also stays this area, so it also would be cleaner yearly or if blockages occur.

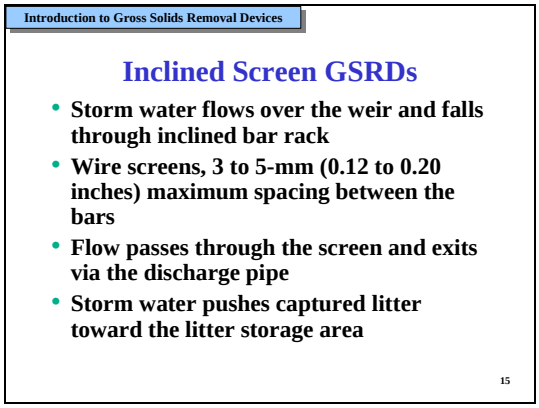


Source: Caltrans

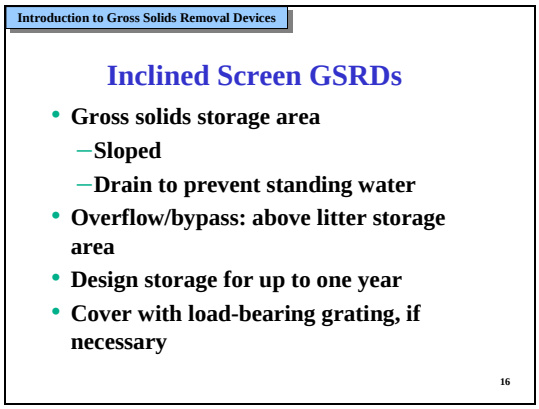
Slide 13: On this slide, litter-laden stormwater enters from the right, enters a trough, and rises over the trough. During its fall down the screens (there are always two screens placed, in an "L" shaped arrangement), the litter is separated from the water and is contained in the 'litter storage area', while the now clean stormwater passes through the screen, into a collection 'box' and exits the device via the pipe on the left of the slide. There is a fairly significant hydraulic drop within the device. As with all the approved GSRD devices, the litter storage area is sized to accommodate 1-years worth of litter. Design is therefore based both on the annual litter loading and the Highway Design Manual storm event Q that must pass through the device (unless it is placed off-line).



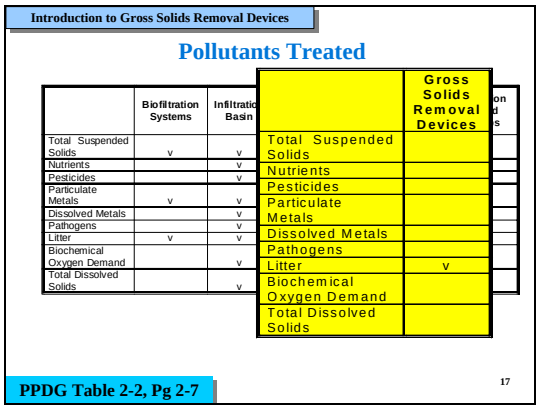
Slide 14: These are schematics of the Type 2 Inclined Screen GSRD. On this slide, the lower oblique view, litter-laden stormwater enters from the right at the elevation of the screen; during its fall down the single screen, the litter is separated from the stormwater and is contained in the 'litter storage area', while the now clean stormwater passes through the screen and exits the device via the pipe on the left of the slide. There is a fairly significant hydraulic drop within the device. As with all the approved GSRD devices, the litter storage area is sized to accommodate 1-years worth of litter. Design is therefore based both on the annual litter loading and the Highway Design Manual storm event Q that must pass through the device (unless it is placed off-line).



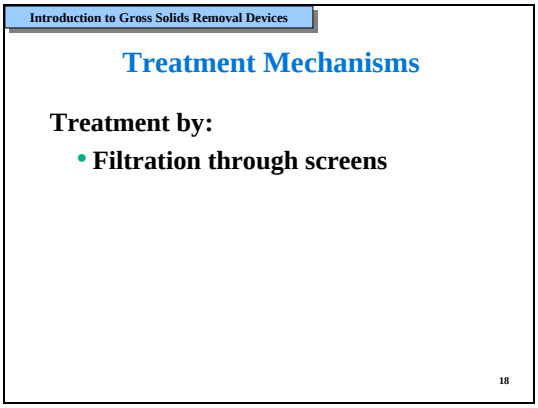
Slide 15: We have discussed many of these requirements while reviewing the previous slides.



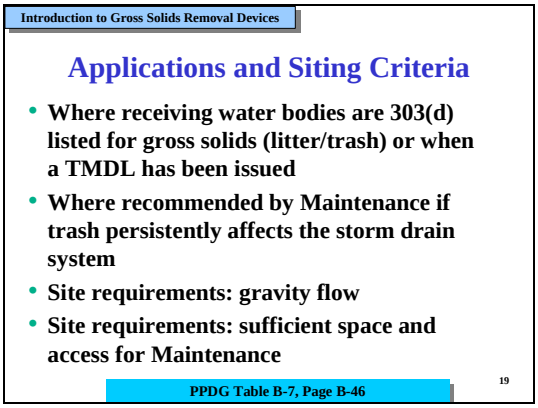
Slide 16: These are some other features of the two Inclined Screen GSRD designs.



Slide 17: As shown, GSRDs are only approved at this time for removal of litter, although at some locations a considerable volume of sediments have also been captured. GSRDs are considered on Checklist T-1, Part 1; under Step 2 on that Checklist; the TDC process is usually considered to being on that Checklist as beginning with Step 5 for certain pollutants.



Slide 18: Treatment in the GSRDs is by filtration through screens.



Slide 19: Some of the appropriate applications and siting criteria shown here; consult Table B-7 for a complete list.

•Where receiving water bodies are 303(d) listed for gross solids (litter/trash)

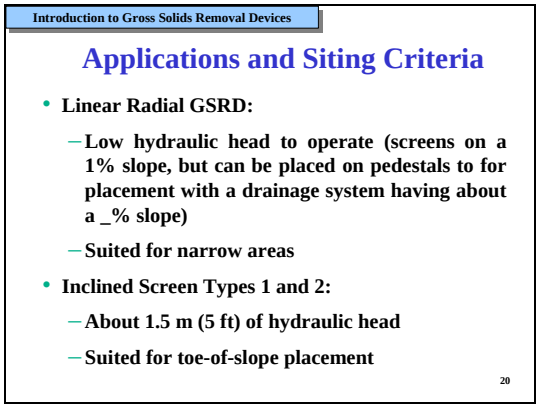
•Where receiving water bodies have TMDLs for litter issued

•Where recommended by Maintenance if trash persistently affects the storm drain system

•Site requirements - gravity flow

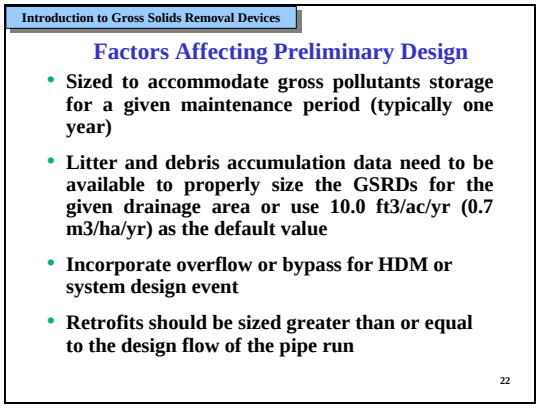
•Site requirements - sufficient space and access for Maintenance: Allow sufficient

space for maintenance and inspection. Vactor trucks and other trash removal equipment are required to clean the units.



Slide 20: These are some of the siting parameters for the GSRDs.

Slide 21: GSRDs are designed for either:
•HDM event, which is particular storm which contributes runoff which the drainage facilities are designed to handle (the HDM design storm is typically one with a return period of 25, 50 or 100 years – Refer to HDM Section 830); or
•The 'regulatory event' with upstream bypass for larger storms; A 5 mm litter size is the requirement of Los Angeles River watershed trash TMDL set by the LA RWQCB; under their design event, a 1-year, 1 hour event – litter transported by more intense events may bypass the system without violating the TMDL; however, at this time it is Caltrans policy to capture rainfall events up to the 'Highway Design Manual' event, refer to HDM Topic 830 for a definition of the HDM event, or consult with District Hydraulics.
•Consult District Hydraulics for determination of the design storm and peak flow rates.



Slide 22:

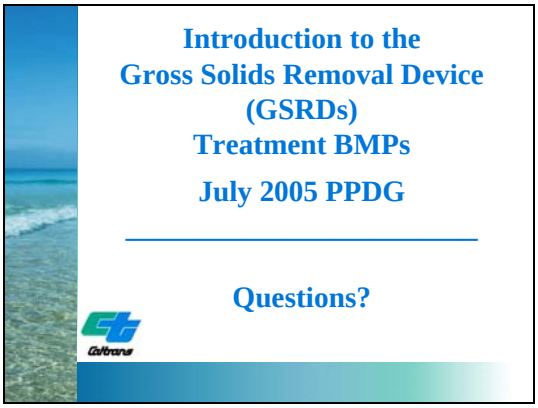
•These are some of the Preliminary Design Factors shown on Table B-7 of the PPDG; see that table for a complete list and for any updates. Sized to accommodate gross pollutants storage for a given maintenance period (typically one year)

•Litter and debris accumulation data need to be available to properly size the GSRDs for the given drainage area or use 10.0 ft^3/ac/yr (0.7 m^3/ha/yr) as the default value: The litter loading rate includes a factor of safety of 2.

•Incorporate overflow or bypass for HDM or system design event. Present plans include this.

•Retrofits should be sized greater than or equal to the design flow of the pipe run.

Not shown as a bullet: the maximum inflow and outflow pipe diameters varies with the height of the vault – consult the plans for the GSRD devices, available from the HQ Office of Storm Water Management.



Slide 23: Please contact your NPDES coordinator later in the design process if you have questions, or call the Headquarters Design Office of Storm Water Management.