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Chapter 5 – Equivalency and Treatment Trains

A treatment train system combines multiple EPSC measures in a sequence that manages stormwater and soil movement throughout a construction site. The goal is to control erosion at the source, reduce runoff velocity, and capture transported sediment before it leaves the disturbed area. The first and most important step in erosion prevention and sediment control is minimizing soil disturbance and preserving the existing vegetative cover. Well-planned projects avoid and minimize adverse impacts, and where disturbance is necessary, the least impactful construction processes are chosen. Final stabilization should be implemented as soon as possible.

The treatment train begins with erosion prevention measures such as minimizing soil disturbance, protecting riparian buffers and other protected areas, and combines erosion protection such as soil stabilization, slope protection, diversion ditches, and temporary seeding to minimize soil detachment. Runoff is then directed through intermediate controls such as check dams or filter berms to slow flow and promote settling. At the downstream end, final sediment controls (e.g., silt fences, sediment basins, or outlet protection) provide additional treatment before discharge. Properly designed and maintained treatment train systems ensure that each control practice supports the next, providing layered protection against sediment loss and maintaining compliance with permit requirements.

When site constraints preclude the implementation of typical EPSC measures, treatment trains that achieve the same (or better) expected result in terms of sediment retention (i.e., equivalency) can be used instead of a single EPSC, such as a sediment basin, a sediment trap, or a riparian buffer. For example, a sediment basin may not be practicable when the site has limited or dispersed available space, a low depth to groundwater table, limited access to the ideal sediment basin location, presence of bedrock near the ground surface, permanent detention is not planned, etc. Therefore, the design engineer may consider a treatment train system that, when acting collectively, achieves the same, or better, expected results as the single structural measure. Similarly, if construction activities result in encroachment of and disturbance to a stream buffer, an equivalent measure, or treatment train, must be implemented upgradient, documented in the EPSC plans, and provide the same, or better, expected benefits as the stream buffer.

When considering equivalency in EPSC and site design, the engineer is encouraged to consider and/or utilize various EPSC measures and differing designs. In the same regard, structural measures may be required onsite, and while it may be feasible to incorporate them into the site layout, they may not provide the preferred environmental benefit. In such



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cases, the engineer is also encouraged to exercise their professional judgement and consider a variety of treatment train options in comparison to the required measure. In either scenario, the engineer is to justify their proposed equivalent design by providing engineering calculations demonstrating efficacy and equivalency to what is required.

5.1 Justification and Calculations

Most structural measures, such as a sediment basin and trap, have design guidance in place to trap sediment generated and transported from the design storm. Engineers use the design storm to determine the sizing of structural measures; however, through equivalency, the required sizing can be distributed amongst a number of sediment control measures within the same drainage area. This can be either a combination of different measures or multiple of the same.

Under this approach, the sizing and treatment of each measure is to be calculated and summed to treat the same or greater volume of sediment. The engineer can implement erosion prevention measures to reduce the sediment yield (Section 2.2) from the site. Specifically, the engineer is to provide calculations demonstrating that the treatment train provides the required treatment volume from the design storm per the CGP, provide calculations demonstrating that a reduced sediment yield (e.g., Eqn 11, Section 2.2.1) will result in the same or better expected benefits of sediment retention, or a combination of the two. Ultimately, this can be achieved by incorporating measures to reduce the required treatment volume if applicable or necessary (e.g., diversions), comparing the volume of runoff treated onsite from the treatment train to that which is required, and reducing the C, LS, or P factors in Eqn 11 (or similar if a different sediment yield estimation method is used).

5.2 Redundancy

Treatment trains are often desirable, as they can be used to capitalize on the varied treatment mechanisms of different EPSC measures. For example, an EPSC measure that relies on sedimentation (such as a sediment basin) can be coupled with an EPSC measure that relies on filtration (such as a filter berm) to target different sediment sizes. Such configurations allow creativity for the engineer and treatment of sediment closer to its source. Additionally, if two EPSC measures of the same type are in series, it may be easier to fit the required treatment volume on the site without the need for excessive grading. That is, multiple smaller measures can be used instead of having to provide space for one large measure. Furthermore, the forebay of a sediment basin may consist of a channel with check dams that widens into the basin or be disconnected from the main basin itself, providing pre-treatment, or additional treatment, for a basin with easier access for maintenance.



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5.3 Treatment Train Examples

The engineer may show equivalency from any combination of EPSC measures installed as a treatment train. However, commonly installed treatment trains throughout the state of Tennessee include:

- A series of check dams that can lead to a sediment trap;
- Check dams and sediment traps sequentially in series (linear sites);
- Expedited slope stabilization measures leading to a silt fence or a slash mulch berm;
- Slope drains discharging to a conventional riprap apron, sediment basin, or stilling basin;
- Sheet flow being treated by a series slash mulch berm and/or silt fence;
- Check dams used as a forebay for a sediment basin; and
- Wattles on the slopes breaking up concentrated flow that are placed upgradient of silt fence.