4.4.12.3 Dewatering Structure

Source: TDOT

Definition and Purpose

A dewatering structure is a temporary sediment control device designed to process and treat water that has been pumped or drained from excavated or work areas during construction. Dewatering structures ensure slurry water, stormwater, or other non-stormwater accumulated from construction activities is managed and treated before discharge.

Appropriate Applications

Dewatering structures are applicable in situations where sediment laden water must be removed from construction activities through pumping, such as from excavations, trenches, cofferdams, piles, ditches, or other depressed areas where water accumulates (CalTrans, 2017). They are used to manage both stormwater and non-stormwater, including groundwater and water generated during construction operations, and when stormwater and non-stormwater mix. In these applications, dewatering structures provide an effective alternative to sediment filter bags (Section 4.4.12.6) by allowing water to be collected, settled, and filtered before being discharged off-site. They are most effective when placed on flat or gently sloped areas that infiltrate a large quantity of discharge.

Limitations and Maintenance

Dewatering structures are not to be installed within jurisdictional wetlands or within close proximity to water resources, especially ETWs. Filtering devices must be assessed frequently, often daily during operation, and routinely during site inspections. Accumulated sediment is to be removed once half the capacity of the structure is reached. If sediment buildup reduces function, the structure should be repaired or replaced. Removed sediment must be

stabilized onsite or disposed of at approved locations, and if commingled with other pollutants, handled in accordance with the applicable local regulations. Continuous monitoring is also necessary to ensure discharges do not cause downstream erosion, with additional stabilization measures such as blankets, matting, or filter socks applied where necessary.

Planning and Design Considerations

Because water pumped from construction sites typically contains high sediment loads, structures must be selected and designed to effectively capture sediment without causing downstream erosion, scour, or sedimentation. A dewatering structure may not be necessary if water can be discharged to a flat, well-vegetated, and stabilized area capable of filtering sediment and withstanding discharge velocities. Various types and innovations of dewatering structures (conventional riprap and a geotextile, portable tanks, filter boxes, and a straw bale/silt fence pit) are applicable and presented herein, where the most ideal type is governed by site-specific conditions (VDEQ, 2024). Discharges must remain within project limits whenever possible, with disposal required if constraints or contamination prevent onsite release. Do not discharge polluted waters as indicated by odor, oily sheen, discoloration, or foam (CalTrans, 2017). Offsite stormwater should always be diverted away to maintain efficiency.

While there are various types of innovations for dewatering structures, most can be designed by considering three components: size, location, and lining. The design of dewatering structures must ensure that pumped water passes through the filtering device without overtopping the system. Pumping operations should cease once the water level nears the top of the structure, allowing the basin to drain down naturally; any remaining water may only be discharged after at least six hours of settling. Required storage volume (cubic feet) is calculated by multiplying pump discharge (gallons per minute) by 16 (TDOT). Placement of the structure is also critical; it should be located downhill and away from stockpiles or spoil piles to prevent recontamination. Further, they should not be positioned where treated water could return to the active workspace. To enhance sediment removal, the structure should be placed such that a well-established vegetated area is downgradient. VDEQ (2024) recommends a vegetated filter length of 75 feet while TDOT recommends 30 feet. In cases where an excavated basin is used, such as a straw bale or silt fence pit, filter fabric lining may be applied to minimize scour and prevent soil within the structure from mixing with discharged water. Additional device-specific design requirements are outlined in the following paragraphs.

The conventional riprap and geotextile structure shall consist of class A-1 riprap and a type II geotextile fabric. Stake the geotextile fabric into the ground at a maximum six-foot

intervals. TDOT recommends a maximum height of 30 inches and stone placed at 2H:1V side slopes, requiring adequate space within the right-of-way or, if necessary, a construction easement for installation and maintenance. An optional excavated area at least three feet deep may be incorporated to capture additional sediment, though its volume is not counted toward total storage since water within it may not fully drain between pumping operations. To ensure proper filtration, a silt fence with wire backing is ideally installed across the downslope side of the structure, preventing residual sediment from leaving with the discharged water.

Alternative to a conventional riprap and geotextile structure, a straw bale or silt fence pit may be used. This structure consists of perimeter barriers (straw bales or silt fence), a stone outlet using riprap and aggregate, and a wet storage pit excavated at least three feet below the perimeter base. The face of straw bales is lined with filter fabric, and installation follows standard barrier guidelines. Capacity is measured from the pit floor to the stone weir crest (VDEQ, 2024).

A portable sediment tank is typically constructed from steel drums, sturdy wood, or other strong materials capable of withstanding the water pressure it must hold. The tank must be at least two feet deep and should be placed where sediment cleanout and disposal can be easily managed without disrupting construction. Tanks should be designed with an emergency overflow.

A filter box is built from durable materials such as steel or sturdy wood, often using 55-gallon drums welded together. The bottom is made porous, either by drilling holes or other methods, which are covered with at least 12 inches of coarse aggregate, sometimes reinforced with hardware cloth. Because water passes quickly through the aggregate, the discharge should flow across at least 50 feet of well-vegetated land for further filtering (VDEQ, 2024). The stone filter should be cleaned and replaced if it becomes clogged. Since the filter box allows minimal settling time, it should only be used where other methods are not feasible.

Example Application

No formal design or quantities are required for this measure and therefore are not presented here.

References

CalTrans. (2017). *Construction Site Best Management Practices (BMP) Manual.*
TDOT. *Drainage Manual Ch10*.
VDEQ. (2024). *Virginia Stormwater Management Handbook.*