Best Management Practices for Managing Mosquitoes in Stormwater Infrastructure

Mosquito-borne disease risk is on the rise in California with the prevalence of West Nile virus, the resurgence of St. Louis encephalitis virus, and reported cases of travel-related Zika, chikungunya, and dengue in recent years. Balancing strict water quality objectives with public health and safety protection is increasingly complex for stormwater practitioners. We urge collaboration with local mosquito and vector control agencies and adoption of Best Management Practices (BMP's) to ensure that stormwater infrastructure is designed and maintained to reduce mosquito breeding potential.

GENERAL STORMWATER MANAGEMENT

- Manage sprinkler and irrigation systems to minimize runoff entering stormwater infrastructure.
- Avoid intentionally pumping, running, or dumping water into stormwater systems.
- Inspect stormwater systems weekly during warm weather to look for standing water or immature mosquitoes.
- Remove emergent vegetation, sediment, trash, and debris from gutters, inlets, and flood channels to prevent the accumulation of water.
- Consult with mosquito and vector control professionals during the design, construction, and maintenance of stormwater infrastructure to ensure projects do not create a habitat for mosquito production.
- Design or modify water impoundment and groundwater recharge structures, such as wetlands, engineered ponds, and percolation basins to minimize mosquito habitats.
- Conduct routine immature mosquito inspections in systems holding water. When mosquitoes are identified, contact your local mosquito control agency for assistance.

STORMWATER CONVEYANCE

- Design proper grade, slope, and vehicular access points into new conveyance structures to ensure that water flows freely and inspections by mosquito control agencies can be conducted regularly.
- Modify the design of planned or existing outfalls to prevent scour depressions that can hold standing water.

STORMWATER STORAGE AND INFILTRATION SYSTEMS (ABOVEGROUND)

- Incorporate design features to prevent or reduce clogged discharge orifices (e.g., debris screens). The use of weep holes is not recommended due to rapid clogging.
- Provide a uniform grade between the inlets and outlets to ensure that all water is discharged in 96 hours or less.
- Avoid the use of electric pumps. They are subject to failure and often require permanent water sumps. Structures that do not require pumping should be favored over those that have this requirement.
- Avoid the use of loose rock rip-rap that may hold standing water.
- Design distribution pumping and containment basins with adequate slopes that drain fully and take into consideration buildup of sediment between maintenance periods.

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STORMWATER STRUCTURES WITH PERMANENT WATER SUMPS OR BASINS (BELOWGROUND)

- Where possible, seal access holes (e.g., pick-holes in manhole covers) to belowground structures designed to retain water in sumps or basins to minimize entry of adult mosquitoes. If using covers or screens, maximum allowable gaps of 1/16 inch will exclude entry of adult mosquitoes. Inspect barriers frequently and replace when needed.
- If the sump or basin is completely sealed against mosquitoes, the inlet and outlet should be completely submerged to reduce the available surface area of water for mosquitoes to lay eggs (mosquitoes can fly through very narrow pipes).
- Design belowground sumps with the access and equipment necessary to allow for easy dewatering of the unit.

STORMWATER TREATMENT PONDS AND CONSTRUCTED TREATMENT WETLANDS

- Stock stormwater ponds with mosquito-eating fish where permitted. These fish are often available from local mosquito control agencies.
- Design and maintain accessible shorelines to allow for brush out of emergent shoreline vegetation, and routine monitoring and control of mosquitoes.
- Design and maintain water depth in excess of four feet to limit the spread of invasive emergent vegetation such as cattails. The edges below the water surface should be as steep as practicable and uniform to discourage dense plant growth that may provide immature mosquitoes with refuge from predators, available nutrients, and prevent effective larval treatments.
- Use concrete or liners in shallow areas to discourage plant growth where vegetation is not necessary and provide a means for rapid dewatering if needed.
- Manage the spread and density of floating and submerged vegetation that encourages mosquito production (e.g., water hyacinth, water primrose, parrot's feather, duckweed, and filamentous algal mats).
- Compartmentalize managed treatment wetlands so the maximum width of ponds does not exceed two times the effective distance (40 feet) of current larvicide application equipment.

GENERAL ACCESS REQUIREMENTS FOR STORMWATER TREATMENT STRUCTURES

- All structures should be easily and safely accessible, without the need for special requirements (i.e., OSHA requirements for "confined space"), to allow for monitoring and abatement of mosquitoes.
- If utilizing covers, the design should include spring-loaded or lightweight access hatches that can be easily opened.
- Provide all-weather road access (with provisions for turning a full-size work vehicle) along at least one side of large aboveground structures that are less than seven meters wide, or both sides if shore-to-shore distance is greater than seven meters.
- Build access roads as close to the shoreline as possible to allow for maintenance and vector control crews to periodically maintain, control, and remove emergent vegetation and conduct routine mosquito monitoring and abatement.

To learn more about the Mosquito and Vector Control Association of California visit: www.mvcac.org
To find your local mosquito and vector control district visit: http://westnile.ca.gov

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