WEST MAUI
PLANNING FOR THE FUTURE

COUNTY OF MAUI
DEPARTMENT OF PLANNING

# WEST MAUI COMMUNITY PLAN

## Drainage and Stormwater Technical Resource Paper

December 18, 2018

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# Introduction

The West Maui Mountains are more than just a beautiful backdrop to the developed places in West Maui. The deep valleys, gulches and ditch systems convey water mauka to makai, historically providing fertile and irrigated ground for agriculture. With increased urbanization and a changing climate, we are experiencing more extreme weather causing greater flooding through communities and increased pollution from runoff that are impacting the reefs. A collective approach involving residents, businesses, landowners, the County, and State and Federal agencies is needed to address these considerable challenges.

## Countywide Policy Plan and Maui Island Plan

The protection of the natural environment and improvement of physical infrastructure are two key strategies identified in the Countywide Policy Plan. Under these strategies, there are a number of objectives and policies that address flooding, erosion, stormwater runoff, and pollution. The Maui Island Plan (MIP) identifies three goals relevant to this plan:

- Goal 2.2: An intact, ecologically functional system of reef, shoreline, and nearshore waters that are protected in perpetuity.
- Goal 2.3: Healthy watersheds, streams, and riparian environments.
- Goal 3.1: Maui will be disaster resilient.

MIP objectives include the following:

- Objective 2.2.1: A more comprehensive and community-based ICZM (Integrated Coastal Zone Management) program.
- Objective 2.2.2: Improved reef health, coastal water quality, and marine life.
- Objective 2.2.3: Water quality that meets or exceeds State Clean Water Act standards.
- Objective 2.3.1: Greater protection and enhancement of watersheds, streams, and riparian environments.
- Objective 2.3.2: Decreased NPS (nonpoint source) and point source pollution.
- Objective 2.3.5: Limited development in critical watershed areas.
- Objective 3.1.2: Greater protection of life and property.

The MIP also includes many policies and implementing actions that support these goals and objectives.

## West Maui Community Plan

The 1996 West Maui Community Plan (WMCP) addresses drainage and stormwater across several different plan elements including Land Use, Environment, Urban Design, and Infrastructure. The objectives, policies, and implementing actions cover management of flood risk, stormwater runoff, sedimentation, water quality, watershed protection and integration of open space. The update of the WMCP will be consistent with the Countywide Policy Plan and MIP, and provide guidance for addressing stormwater and drainage needs and priorities for West Maui.

# Existing Conditions

Drainage in the West Maui region is characterized by several streams carrying water from the higher elevations of West Maui Mountains through deep valleys to the lower sloping coastal plain. Eleven streams are perennial with groundwater feeding streamflow in the upland areas. Surface flows are diverted from many streams through ditch systems to be used for offstream uses, such as irrigation and agriculture.

In urban areas, impervious surfaces such as parking lots, roads, and rooftops prevent rainfall from infiltrating, or seeping, into the ground. The result is more rainfall flowing off these surfaces, also known as stormwater runoff. Sediment, nutrients, and other pollutants also wash into the drainage systems and impair the water quality of streams and the ocean.

To minimize flooding, drainage systems have been installed in many locations to collect and deliver rain water more quickly to nearby streams or directly to the ocean. Structures or facilities have been constructed within the watershed often along stream segments to reduce the risk of erosion and flooding. Even with drainage systems or facilities in place, inland flooding can occur from stream flows, flash floods, sheet flows, and stormwater runoff. Coastal flooding is also a concern in West Maui and is addressed in the Climate Change and Sea Level Rise Technical Resource Paper.

The Federal Emergency Management Agency (FEMA) has identified 15 main sources of flooding in West Maui including:

- Hahakea Gulch
- Honokowai Stream
- Mahinahina Gulch
- Kahoma Stream
- Napili Gulch 4
- Olowalu Stream
- Honokeana Bay Gulch
- Kahana Stream
- Napili Gulch 3
- Olowalu Gulch 2
- Kauaula Stream
- Honokahua Stream
- Napili Gulch 2
- Napili Gulch 5
- Kaopala Gulch

Source: MEMA, 2015

Location of flood hazard areas have been mapped by FEMA and are depicted on Flood Insurance Rate Maps (FIRMs), which are further discussed in the Climate Change and Sea Level Rise Technical Resource Paper.

The County Department of Public Works (DPW) is responsible for managing the planning, design and construction of drainage projects for the County. The County DPW also works with other agencies such as the U.S. Army Corps of Engineers (USACE) and the Natural Resource Conservation Service (NRCS) on drainage projects. Drainage projects include sediment and debris basins, underground drainage piping, and flood control channels.

Several sediment basins and flood water diversions have been constructed in West Maui watersheds to manage sediment and nutrient discharges as well as minimize flood damage.

County drainage facilities servicing West Maui include:

- Sediment Basins: 6 from Honokowai to Napili
- County flood channels: Mahinahina
- Federal flood channels: Kahoma Stream Flood Control Project
- Lahaina Watershed Flood Control Project Phase 1, 2B, and 3A
    - In partnership with the West Maui Soil and Water Conservation District and the NRCS, the floodwater diversion system is intended to reduce flooding and erosion problems on land and excess sedimentation on the nearshore coral reefs. The project is located south of Lahainaluna to Launiupoko. Three out of five phases are complete.

The County also participates in FEMA's National Flood Insurance Program (NFIP) which provides affordable flood insurance to property owners and encourages floodplain management within communities. The County recently improved its community rating under the NFIP by completing additional floodplain management activities to reduce flood risks. The reduction in the community rating lowers flood insurance premiums for residents.

# Key Challenges

## Impervious Surfaces and Inland Flood Risk

Increases of impervious surfaces over the landscape from new development will increase the amount of stormwater runoff. This could increase the frequency and extent of inland flooding if the existing drainage system does not have sufficient capacity to handle the added stormwater. Improvements to existing facilities or construction of new facilities may be required. There are opportunities to incorporate strategies to reduce the impact of new development on stormwater runoff and flood risk.

## Water Pollution from Point and Nonpoint Sources

Nonpoint source (NPS) pollution occurs when rainfall flows over land surfaces and through the ground, picking up and moving pollutants to drainage systems, streams, and the ocean. NPS pollution comes from many different sources. Pollutants include heavy metals and chemicals that are washed from surfaces such as roads and parking lots; nutrients and chemicals from fertilizers and pesticides used in landscaped areas, golf courses, and agricultural lands; and excess sediment from agricultural lands and other areas of exposed soil such as dirt roads and roadside shoulders.

Unpaved roadside.
Photo credit: Napili Bay and Beach Foundation

Additionally, during heavy rainfall, stormwater runoff can cause overflow of wastewater systems such as cesspools or septic tanks, and wastewater treatment facilities. As a result, streams and the ocean can become contaminated with harmful micro-organisms and other pollutants. The State of Hawaii Department of Health issues

brown-water advisories warning the public to stay out of floodwaters and stormwater.

Unlike NPS, point source pollution comes from a specific identifiable source such as an industrial or wastewater treatment plant. Pollutants from point sources and NPS impair streams, groundwater, wetlands, and nearshore waters, and have had an impact on watershed and coral reef health.

To prevent point source pollution, the County DPW implements programs that focus on illicit discharge detection and elimination; public outreach; good housekeeping awareness, and industrial and commercial inspections.

Efforts to prevent and reduce NPS pollution in West Maui include the West Maui Ridge to Reef (R2R) Initiative. The R2R Initiative is a multi-agency and organization approach to address adverse impacts to coral reefs by reducing land-based sources of pollution. Others such as the Coral Reef Alliance, West Maui Soil and Water Conservation District, and West Maui Mountains Watershed Partnership are also engaged in other watershed-related management activities.

## Climate Change

Extreme rain events are predicted to become more frequent with changing climate conditions. High frequency flood events (e.g. 10-year floods) are anticipated to increase in frequency and intensity, resulting in more runoff and flooding (Maui Emergency Management Agency, 2015). These events could change drainage patterns and increase erosion and sedimentation that can impact natural habitats, water quality, and the community. Additionally, increases in rainfall intensity and changes in drainage patterns could affect the performance of existing dams and reservoirs.

Groundwater inundation is another concern for West Maui's existing drainage infrastructure. Groundwater inundation is the flooding that results from the groundwater level being elevated due to sea level rise. Existing drainage systems may not have the adequate capacity to accommodate higher groundwater levels in low-lying areas, which will contribute to ponding or flooding at roadways.

Consideration of potential effects from climate change will be important in the County's long-term planning, design, and operation of its drainages in West Maui.

## Alterations of Streams

Measures and structures put in place along a stream to improve drainage or divert water can negatively affect the watershed. Structures such as dams, sediment basins, and reservoirs disrupt stream flow and can obstruct movement of aquatic species. Flood control channels often cut the connection between the stream channel and its floodplain, disrupting the natural functions of the floodplain such as flood and erosion control. Flood control channels can also alter the way water flow and infiltrate into the ground. These structures often result in the reduction or removal of natural habitats. A comprehensive and integrated approach to watershed management and thoughtful planning and project design are important factors for a healthier watershed.

### Aging Infrastructure and County DPW Budget Constraints

The County DPW infrastructure is aging. Metal drainage pipes used decades ago are beginning to corrode and deteriorate. Bridges and other infrastructure are in need of maintenance and improvements to continually meet safety standards. With public safety a priority, the County DPW's focus is on maintaining its existing infrastructure. Under current funding levels, it is difficult for the County DPW to keep up with needed maintenance. Additionally, opportunities for the County DPW to expand other programs or initiatives such as integrated watershed management are limited. Collaboration and partnerships with other local, state, and federal agencies and organizations will provide opportunities to leverage limited resources.

## Strategies

A brief review of the strategies, policies and actions that relate to the key issues is presented below.

### Integrated Watershed Management

All levels of government and other organizations work collectively to address water quality and ecosystem impacts from stormwater runoff. Many efforts to prevent and reduce point and NPS pollution in the West Maui region align with watershed-based management.

As described in the MIP, the State maintains and carries out a comprehensive strategy to prevent and reduce polluted runoff through the State's Nonpoint Source (NPS) Management Plan (2015) and Coastal Nonpoint Pollution Control Program Management Plan (1996). The plans emphasizes a coordinated approach among federal, state, and local water quality agencies in addressing NPS pollution.

As described in the NPS Management Plan, the State's approach to NPS pollution includes water quality monitoring, water quality assessment, planning, and implementation of strategies and actions. In its planning approach, the State has identified priority watersheds to focus efforts and resources to prevent and reduce NPS pollution. The State uses watershed-based plans as one of its important tools in identifying strategies and priority projects to fund.

The West Maui watersheds were selected as priority watersheds in 2007 and two watershed management plans have been completed covering Wahikuli-Honokowai (2012) and Kahana, Honokahua and Honolua (2016). These plans recommend pollution control strategies that can be carried out by different entities to reduce NPS pollutants. For example, the R2R Initiative uses these watershed management plans to help direct its priorities.

The U.S. Army Corps of Engineers (Corps) is currently leading a West Maui watershed study to understand how better to manage the West Maui watershed as a whole. The Corps is exploring ways on how to manage sediment erosion and reduce the greatest sources of sediment to the ocean. In conjunction with the Corps' work, the U.S. Geological Survey is studying where the sediment is traveling in the marine environment and what resources are being affected. Based on the information and findings, the Corps plans to identify recommended actions that can be undertaken by other entities to address sediment erosion and its negative effects.

The County addresses point source and NPS pollution through zoning, permitting, and other programs carried out by the County's Planning, Public Works, Water Supply, and Environmental Management Departments. For example, the County carries out and enforces regulatory requirements of development plans and permits, including grading, grubbing and stockpiling permits. Through its Storm Water Management Program, the County DPW manages stormwater runoff through drainage and grading requirements that apply across all of Maui County.

As discussed above, opportunities for the County DPW to expand other programs or initiatives such as integrated watershed management are limited. Collaboration and partnerships with other local, state, and federal agencies and organizations will provide opportunities to leverage limited resources.

MIP Policy 2.2.1.d incorporates the State's NPS Management Plan (2015) and Coastal Nonpoint Pollution Control Program Management Plan (1996), where consistent with the MIP. MIP Policy 2.2.1.d also incorporates the Beach Management Plan for Maui (2008) and Hawaii Ocean Resource Management Plan (2013) to address pollution and management of the beach and ocean. There are many other MIP policies and implementing actions that target point and NPS pollution directly and indirectly, such as those included under Objectives 2.2.1, 2.2.2, 2.2.3, 2.3.1, 2.3.2, and 2.3.5.

## Smart Growth, Green Infrastructure and Low Impact Development

"Smart growth" includes development strategies for creating neighborhoods and communities that also provide benefits to stormwater and water quality. Smart growth strategies promote compact development in existing communities to create less impervious surfaces and conserve open space. With less impervious surfaces, more rainwater can infiltrate into the ground and limit the amount of stormwater entering the drainage systems and subsequently the ocean. This may also limit the need for new or extensive improvements to the drainage system.

Green infrastructure and Low Impact Development (LID) have been used interchangeably to describe a resilient approach to managing stormwater through planning, design, and structural best management practices (BMPs). In contrast to diverting stormwater away from the built environment through traditional "grey infrastructure" such as pipes and sewer networks, green infrastructure or LID promote use of natural systems to manage stormwater as close to its source as possible, thereby reducing runoff and pollutants.

The State of Hawaii LID Practitioner's Guide (2006) identifies practices and techniques focused on preservation of natural features and conservation design; reduction of impervious cover; and, utilization of natural features and source control for stormwater management. Example techniques include preservation of undisturbed areas and buffers, roadway and parking reduction, rain gardens, and infiltration.

MIP Policy 2.3.2.b calls for the support for the use of LID techniques such as those described in the State of Hawaii LID Practitioner's Guide. MIP Policy 7.2.1.f also encourages the use of alternative stormwater management techniques that minimize land disturbances and preserve natural drainage features.

## Flood Hazard Mitigation

The Maui County Hazard Mitigation Plan (HMP) Update (2015) identifies a number of mitigation initiatives to address flood hazards. The mitigation initiatives cover flood proofing of water and wastewater treatment facilities; inspection, maintenance and operation of drains; increasing drainage and absorption capabilities of facilities; management of floodplain and hazard-prone areas; compliance with the NFIP; and participation in the Community Rating System program. The HMP also includes a review of climate change considerations on flooding. The HMP identifies the need to factor a new level of safety into the design, operation, and regulation of flood protection facilities.

Under the NFIP, the County establishes and carries out measures to reduce the risk of flooding within the communities of Maui. Such measures include requirements for zoning, subdivision, building codes, and special flood hazard areas.

To support a more disaster resilient Maui, the County is committed to implementing the HMP to the extent that is consistent with the MIP (MIP 3.1.2-Action 2). The MIP also includes a policy to give consideration of the location of dam, reservoir, holding ponds and other water-containing entities that are upstream of inhabited areas to anticipate, avoid, and mitigate inundation risks, and discourage new development in areas where possible inundation hazards may exist (MIP Policy 3.1.2.b). MIP Policy 3.1.2.c also calls for the strengthening of current development standards to minimize destruction of land and property from natural hazards.

## Capital Improvement Program and Other Projects

The County Capital Improvement Program (CIP) funding strategy identifies the County as responsible for funding operations and capital improvements to address existing needs of the County-owned and operated systems. The County DPW will seek opportunities for Federal funding when available. The following are projects identified by the County DPW for West Maui:

Near-Term

- FY19 Napili 4/5 Culvert Replacement on Lower Honoapiilani Road
- FY19 or 20 – Napili 2/3 Basin Sediment Removal
- FY20 Kahananui Bridge Replacement
- FY20 West Maui District Drainline Assessment

Long Term

- Lahaina Watershed Flood Control Project Phases 3B, 4 and 5
- Redesign and construction of Lower Honoapiilani Phase IV from Hoohui to Napilihau Road (sidewalks, drainage, etc)
- Front Street Sidewalk, Railing, and Breakwall Repairs near Lahaina Center and Lahainaluna Road
- West Maui Drainline Repairs
- Lower Honoapiilani Road Pavement Rehabilitation (Honoapiilani Highway to Hoohui Road)

# References and Related Plans and Studies


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