West Maui Curb Inlet Basket Pilot: Performance Report

Final Report
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Prepared for:

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Project Summary

This pilot project was tasked with siting and installing seven curb inlet baskets (CIB) in West Maui. The CIB are removable baskets fitted into existing storm water system curb inlets that capture particulates comprised of eroded soils, asphalt, concrete and other synthetic matter, as well as plant litter, rubbish and pollutants sorbed to the particulates. The baskets are routinely emptied into the landfill, thereby preventing captured pollutants from traveling through the storm water system and being released into the ocean.

The seven CIB were installed on storm sewer inlets along Kāʻanapali Parkway, common property owned and managed by the Kāʻanapali Operator's Association (KOA). KOA assumed responsibility for installing and maintaining the CIB. The locations were preliminarily identified in the Wahikuli-Honokōwai Watershed Management Plan (WHWMP), and confirmed during a site inspection with the manufacturer's representative on October 30, 2013 (Figure 1). Seven CIBs were ordered by GeoTech Solutions from the manufacturer on November 19, 2013. They arrived on Maui on January 8 and were inspected by GeoTech Solutions and Sustainable Resources Group Intn'l, Inc. (SRGII) on January 22, 2014. KOA installed two CIB by February 5, 2014. Additional parts were ordered on February 18, 2014 after it was determined that five of the prefabricated CIBs could not be inserted and installed as a single piece into the inlets. These parts were received on February 28, 2014. Installation of an additional four CIBs was completed by March 7, 2014. The final CIB was installed March 31, 2014.

Regular maintenance was conducted by KOA (findings documented below) and will continue for the lifespan of the CIBs. Regular communication between KOA and West Maui Watershed Coordinator should continue to discuss the ongoing effectiveness of the CIB units.

Maintenance and Monitoring Findings

Maintenance of the CIBs, in the form of cleaning out the collected contents, was performed by KOA maintenance personnel beginning March 16, 2014. The frequency of maintenance of the seven CIBs varied and was a function of the amount of material captured. The KOA crew did not have access to or funds to secure use of a Vactor truck system (the preferred method) to extract the contents from the baskets.[1] Attempts to use a modified shop vacuum to extract the basket contents via access through the manhole were unsuccessful due to the small diameter of the vacuum hose and insufficient suction. Removal of the baskets contents was subsequently, and continues to be done by removing the entire basket from the inlet vault and dumping the collected materials into canisters for transfer to the landfill. This cleaning procedure for CIBs 4, 5, 6, and 7 occurred approximately bi-weekly for the time period of March 16, 2014 thru June 18, 2014 due to the abundant vegetative litter sourced to Monkey Pod trees that were adjacent to these inlets. The abundant leaf litter resulted in rapid filling of the CIB, which if not emptied before the baskets were full, would result in weights that made extraction difficult. This was especially true for CIB 5 that receives water inflows on a daily basis, sourced to wash water disposed into the storm sewer gutter

[1] The recommended procedure, for which the baskets are designed and configured, is to use a Vactor hose inserted into the inlet manhole to suck out the basket contents. Under this maintenance procedure personnel do not have to enter the inlet vault and it takes approximately 10-20 minutes to clean a full basket.

connected to the inlet from the Sheraton Resort. The combination of the Monkey Pod trees and wash water resulted in dense loads in the basket.

KOA personnel were unable to weigh the extracted contents of the baskets or quantify weights or volume of various materials and pollutants collected. Ocular estimates of the contents were made, but detailed records were not kept documenting each maintenance visit. KOA personnel have done and continue to do exemplary maintenance given the challenges of not having a Vactor truck and the required frequency of cleaning out CIBs near the Monkey Pod trees.

Table 1 summarizes the number of cleanings for each baskets, and when estimated, the summation of the breakdown of contents captured for the reporting period of March 16 - July 31, 2014.

Table 1. CIB Maintenance and Monitoring Summary

CIB #	Number of Cleanings	Pollutant		
		Vegetation (%)	Sediment (%)*	Rubbish (%)
1	4	95	1	4
2	4	95	1	4
3	4	95	1	4
4	11	85	15	
5	14	90 (~1,500 lbs)	9	1
6	8	75	20	5
7	8	80	5	15

*Sediment includes soil particles, concrete, asphalt, and other unidentified particulates.

Challenges and Lessons Learned

There were several challenges and related lessons learned during this project. Accurate sizing of the CIB design, including dimensions needed for proper assembly is important. GeoTech Solutions, the manufacturer's representative, requires that they measure each inlet for design purposes. The vaults in West Maui were vertically shallow, and as initially fabricated, several of the pieces of the CIB could not be inserted into the vault. The issues with measuring and installing the CIBs were brought to the attention of the manufacturer's representative in order to avoid similar problems during future installations. Specifically, the depth on the inlet vaults need to be measured and compared to the longest piece of the CIB to make sure the pieces can be inserted in the vaults for assembly with the various other pieces inside the vault. The manufacturer worked quickly to devise a workable solution, but this did add to the time required by KOA to install the units. Future measurements should more accurately take the dimensions of the vault into consideration to facilitate installation.

Installation in coastal areas may need to take tidal fluxes into consideration. Installation of one CIB was delayed due to the need to wait for low tide so there was no water in the vault.

CIB installed in areas that have a significant amount of vegetative litter (e.g. leaves and seeds from trees) require frequent maintenance as the CIB will fill up quickly. It may be prudent to limit installation of CIB

units in these locations in order to maintain a balance between maintenance effort and pollutant reduction. Although it is preferable to empty the basket as soon as possible when full, any debris that enters a full CIB will pass through it as if the CIB were not there; no clogging results. The type of landscaping is also important to consider. The Monkey Pod trees generate a significant amount of pods during the spring and into early summer. Along Kāʻanapali Parkway these trees are numerous, and the entry of the pods into the storm sewer are an annual and ongoing occurrence. It is likely that this influx of pods, and their subsequent decomposition, has resulted in a moderately to high source of nutrients into the storm sewer and subsequently to the ocean.

Maintenance of the CIBs has been challenging due to lack of the preferred maintenance equipment, use of Vactor truck. As a result, the KOA crew has had to manually remove the CIBs to remove the basket contents. This procedure requires more time compared to use of Vactor equipment. KOA personnel have conveyed to Maui County personnel the maintenance challenges they have encountered, which has biased Maui County's perception of CIBs. Under normal maintenance procedures the time and cost using a Vactor truck to clean out the baskets is significantly less.

The effectiveness of CIB in reducing pollutant loads moving through the system has been well documented in performance studies. This project collected limited information on maintenance and monitoring in part due to a tight budget and reliance on maintenance staff for data collection. It was difficult to obtain regularly collected, reliable data as their main priority is system function, not data collection. However, the amount of plant material captured in all CIBs was significant, and represents a significant load reduction of nutrients that would have been input into the ocean if the CIB had not been installed.

There are other potential locations for installation of CIB units in this area. The Watershed Coordinator was approached by Kāʻanapali Beach Hotel about funding one additional CIB installation in the vicinity of the Kāʻanapali Beach Hotel.

As a pilot this project was useful in working out some of the potential issues with future small and large scale installations. The lessons learned from this project will be used during a separate project SRGII is conducting to install 40 CIBs in the Wahikuli and Honokōwai Watersheds being funded by the State Department of Health.

GIS Deliverable

A shapefile, compatible with ESRI GIS software, is being submitted with this deliverable. This shapefile, with metadata, contains seven points indicating the locations of the installed CIBs (WMaui_KOA_CIB_2014.shp).

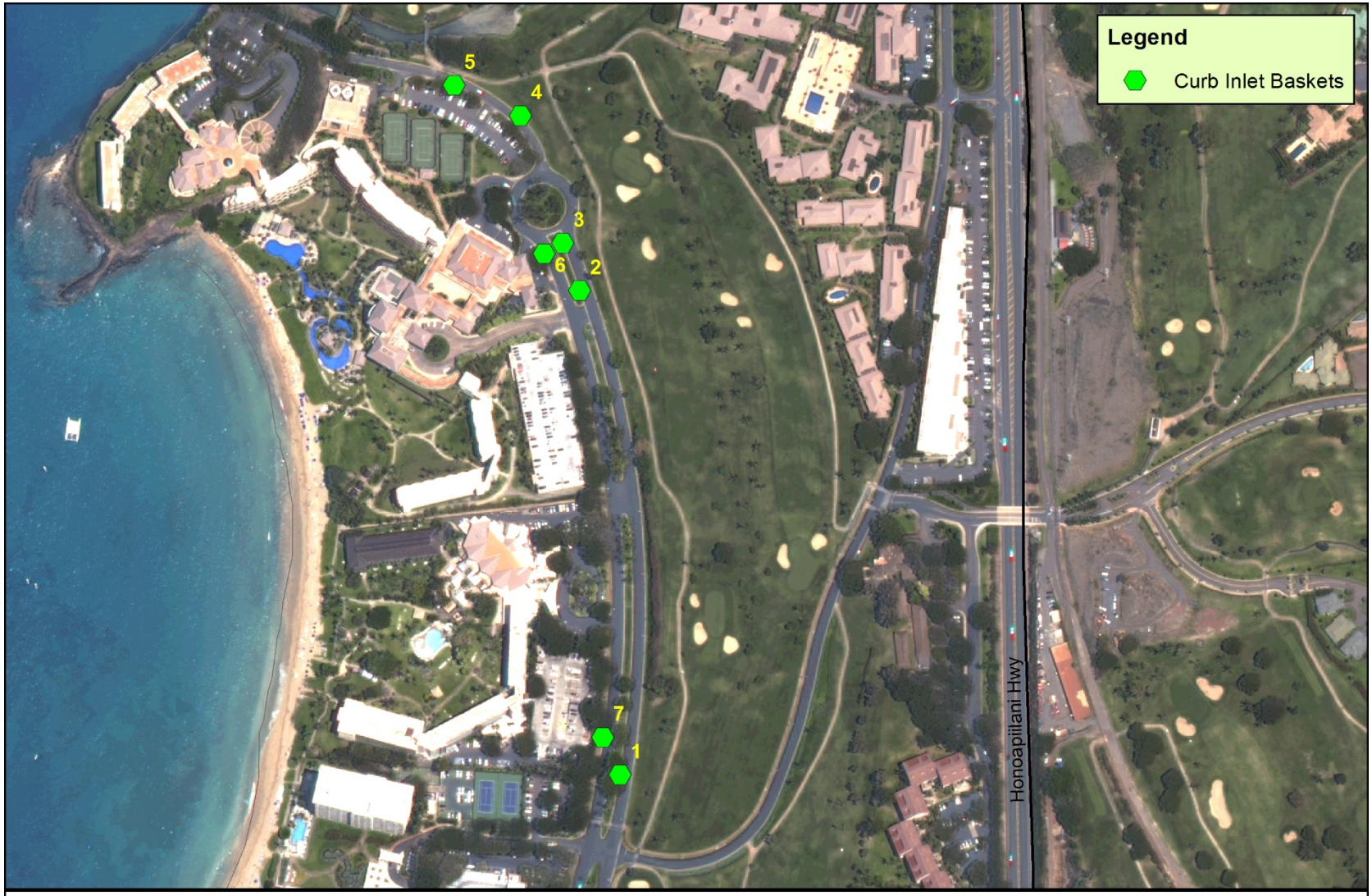

Figure 1. Curb Inlet Basket Locations

West Maui Curb Inlet Basket Installation for Kaanapali Operator's Association
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