

**Miki Basin Industrial Park  
Environmental Assessment**

**Exhibit D**

**Drainage Study**

## DRAINAGE REPORT

**Project:** Miki Basin 200-Acre Industrial Drainage Study  
Lanai City, Lanai  
TMK: (2)4-9-14: 18

**Owner:** Pulama Lanai

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**Checked by:** Gordon Ring

**Date:** January 22, 2019



This work was prepared by me or under my supervision. Construction of this project will be under my observation.

  
Signature  
4/30/20  
G. I. Ring  
Lic. Expiration

### 1.0 PURPOSE

To determine the offsite and onsite drainage system requirements for the proposed Miki 200 Acre Industrial Site that meets the County of Maui Storm Drainage Standards. The Miki 200 Acre Industrial Site project involves development of 3 large parcels adjacent to Miki Road, consisting of a 65-acre light industrial parcel, 100-acre heavy industrial parcel, and a 35-acre light industrial parcel. For the location of the proposed site, see Figure 1.

### 2.0 REFERENCES

- 2.1 *Rules for the Design of Storm Drainage Facilities in the County of Maui*, Department of Public Works and Waste Management, County of Maui, July 14, 1995.
- 2.2 LIDAR Countour Maps provided by Pulama Lanai dated December 2006.
- 2.3 Hydroflow Hydrographs Extensions for AutoCAD Program by Auto Desk dated August 2017 to February 2018.
- 2.4 *Grading and Drainage Report for Miki Basin Heavy Industrial Site*, Austin Tsutsumi & Associates, October 2015.

### 3.0

#### EXISTING SITE CONDITIONS

The proposed project site is mostly undeveloped except for the existing Miki Basin Industrial Condominium site and MECO facility. Existing improvements within the project site include the Miki Basin Industrial Condominium project and MECO facility. The existing onsite terrain is covered with vegetation and slopes at about 5% from Miki Road toward the southeast. There is no existing storm drain system within the project area. Runoff collected in Drain Area 1 and 2 of the project site flows into existing natural drainage ways and discharges into the existing Miki Basin sump, located approximately 2000 feet away (see Figure 2). Runoff collected in Drain Area 3 flows to the existing Palawai Basin.

Southeast of the proposed 100 acre heavy industrial area are the Miki Basin Industrial CPR and an existing MECO facility (see Figure 2). Runoff generated within the existing Miki Basin Industrial CPR site is collected by an onsite drainage system and is discharged offsite. Runoff from the Miki Basin Industrial CPR site will not impact the proposed development since it has a separate discharge point, located south of the heavy industrial parcel. See "Grading and Drainage Report for Miki Basin Heavy Industrial Site" by Austin Tsutsumi & Associates, Inc. for drainage calculations. Offsite runoff, including runoff generated from the MECO facility, is diverted around the Miki Basin Industrial CPR site (within the heavy industrial parcel) and is discharged into the existing drainage way. These existing offsite flows will need to be addressed by the development of the heavy industrial parcel.

Offsite runoff generated from the area north of Miki Road sheet flows and is intercepted by an unlined ditch along Miki Road (see Figure 2). Once in the unlined ditch, the runoff flows towards the southeast direction to a low point in Miki Road, near the existing MECO facility.

### 4.0

#### PROPOSED SITE CONDITIONS

The proposed 200 acre industrial development will consist of a 65-acre light industrial parcel (Drain Area 1), 100-acre heavy industrial parcel (Drain Area 2), and a 35-acre light industrial parcel (Drain Area 3). This development will increase the amount of impervious area within the project. Offsite runoff will be intercepted before entering the project site by proposed drainage ditches. The drainage ditches will divert runoff around the perimeter of the project site to an offsite discharge point downstream. Onsite runoff will be collected by a proposed underground storm drain system consisting of pipes and inlets. Runoff from 65-acre light industrial parcel, 100-acre heavy industrial parcel, and DA Offsite 1 through 3 will be discharged to the existing drainage way that drains to Miki Basin (see Figure 4). Runoff generated from the 35-acre light industrial parcel and DA Offsite 4 drain to the existing Palawai Basin.

**CALCULATIONS FOR RUNOFF INCREASE**Onsite

Runoff flow rates for areas less than 100 acres were calculated for a 10-year, 1-hour storm event using the rational method for the existing and proposed site conditions of Drain Area 1 and Drain Area 3. The runoff flow rate for a 100-year, 24-hour storm event were calculated using the SCS method for the existing and proposed site conditions of Drain Area 2 since the drainage area is 100 acres. See Tables 1 and 2 for a summary of the existing and proposed runoff quantities. The proposed industrial parcels will increase the runoff generated within the project site by 339,88 cfs (see Table 3).

Offsite

Runoff flow rates for a 100-year, 24-hour storm event were calculated using the SCS method for the existing site conditions of DA Offsite 1 and DA Offsite 2, since these offsite areas are greater than 100 acres. Runoff flow rates for a 10-year, 1-hour storm event were calculated using the rational method for the existing and proposed site conditions of DA Offsite 3 and DA Offsite 4, since these offsite areas are less than 100 acres. See Tables 1 and 2 for the existing and proposed runoff quantities.

Runoff generated from areas DA Offsite 1, 2, and 4 will be collected by interceptor ditches located along the project site exterior boundary and will ultimately discharge into the existing drainageway south of the project site and to Miki Basin per existing conditions. Offsite runoff for DA Offsite 3 will be diverted under Miki Road by a culvert and around the existing Miki Basin Warehouse area. Runoff from DA Offsite 3 will be discharged into an existing offsite drainageway adjacent to the industrial CPR site. Therefore, the offsite runoff will not affect the design of the onsite drain systems.

At a depth of 10 feet, the existing Miki Basin has a capacity of 891 ac-ft. Since the increase in runoff from Drain Area 1 and Drain Area 2 only contributes 38.1 acre-feet, the increase in runoff depth and flow rate will be contained within the existing basin. See Table 4 for the volume summary.

At a depth of 10 feet, the existing Palawai Basin has a capacity of 3010 ac-ft. Since the increase in runoff from Drain Area 3 contributes only 2.5 acre-feet, the increase in runoff depth and flow rate will be contained within the existing basin. See Table 4 for the volume summary.

Table 1 – Existing Runoff Quantities

Drainage Area Name	Area (Acres)	Q <sub>10</sub> (cfs)	Q <sub>100</sub> (cfs)
DA 1 *	65.0	87.36	-
DA 2**	100.0	-	576.00
DA 3 *	32.6	25.56	-
DA OFFSITE 1**	155.3	-	316.5
DA OFFSITE 2**	81.7	-	166.5
DA OFFSITE 3*	88.5	71.86	-
DA OFFSITE 4*	8.6	11.56	-
Total		196.34	1059.00

\* Calculated using Rational Method

\*\*Calculated using SCS Method

Table 2 – Proposed Runoff Quantities

Drainage Area Name	Area (Acres)	Q <sub>10</sub> (cfs)	Q <sub>100</sub> (cfs)
DA 1 *	65.0	249.60	-
DA 2**	100.0	-	667.20
DA 3 *	35.0	112.00	-
DA OFFSITE 1**	155.3	-	316.5
DA OFFSITE 2**	81.7	-	166.5
DA OFFSITE 3*	86.1	69.91	-
DA OFFSITE 4*	8.6	11.56	-
Total		443.07	1100.20

\* Calculated using Rational Method

\*\*Calculated using SCS Method

separate. Offsite runoff from DA Offsite 2 flowing towards the 100-acre parcel is 166.50 cfs and will be intercepted an 8 ft. by 8 ft. interceptor ditch on the west perimeter of the parcel. Runoff from the proposed 35-acre light industrial area (Drain Area 3) will be discharged at the eastern side of the parcel (see Figure 4). Onsite runoff flow for this area is 112.00 cfs and ultimately flows to Palawai Basin. Offsite runoff south of the 35-acre parcel from DA Offsite 4 will be intercepted by a 2 ft. by 3ft. interceptor ditch on the south perimeter of the parcel and will discharge to Palawai Basin. Runoff flow for the offsite area is 11.56 cfs.

The increase in onsite runoff volume from Drain Area 1 and Drain Area 2 will be conveyed to the existing drainage way and can be easily accommodated in the existing Miki Basin. The additional runoff volume is negligible compared to the available basin capacity. The increase in onsite runoff volume from Drain Area 3 will be conveyed to the existing Palawai Basin. The additional runoff volume is negligible compared to the available basin capacity.

Storm water treatment will not be provided for this project since the runoff flows into an existing offsite sump with no outlet to the ocean.

## 7.0 CONCLUSION

The development of the proposed industrial parcels will increase the runoff onsite by 339.88 cfs (see Table 3). The additional flow generated within the proposed parcels can be accommodated by the existing Miki Basin and Palawai Basin. Therefore, the proposed 200-acre industrial development will not have an adverse impact on any existing downstream properties.

Table 3 – Runoff Summary

Drainage Area Name	Existing Q (cfs)	Proposed Q (cfs)	Increase in Q (cfs)
DA 1	87.36	249.60	162.24
DA 2	576.00	667.20	91.20
DA 3	25.56	112.00	86.44
		<b>Total</b>	<b>339.88</b>

Table 4 – Volume Summary

Drainage Area Name	Existing Volume (ac-ft)	Proposed Volume (ac-ft)	Increase in Volume (ac-ft)
DA 1 + DA 2 (to Miki Basin)	74.9	113.0	38.1
DA 3 (to Palawai Basin)	3.2	5.7	2.5

## 6.0

### STORM WATER MANAGEMENT

Existing drainage patterns will be maintained by discharging intercepted offsite runoff to its original flow path. Offsite runoff will be collected by interceptor ditches located on the perimeter of the site that discharge to existing drainage way and ultimately to Miki Basin (see Figure 4). The proposed concrete rectangular drainage ditches vary in size from 8 feet by 8 feet to 2 feet by 3 feet. The ditches are sized to accommodate the peak runoff flow from the 100-yr, 24-hour storm and 10-yr, 1-hour storm where necessary and provide a minimum 2-foot freeboard.

Runoff from the proposed 65-acre light industrial area (Drain Area 1) will be discharged to the interceptor ditch at the southwest corner of the parcel (see Figure 4). Runoff flow for this area is 249.60 cfs and ultimately flows to Miki Basin. Offsite runoff from DA Offsite 1 flowing towards the 65-acre parcel is 316.50 cfs and will be intercepted by a 6 ft. by 6 ft. interceptor ditch on the north perimeter of the parcel.

Runoff from the proposed 100-acre heavy industrial area (Drain Area 2) will be discharged at the south end of the parcel (see Figure 4). Runoff flow for this area is 667.20 cfs. The runoff from DA Offsite 3 that is diverted around the existing Miki Basin Industrial site is also discharged at the south end of the parcel. Runoff flow for DA Offsite 3 is 69.91 cfs. Both the runoff flow from the proposed 100-acre site and the DA Offsite 3 flow to Miki Basin. Design of the drainage system for the 100-acre site should consider the impacts of incorporating the existing flows into the proposed drainage system versus keeping them

