Carbon Footprint Analysis for Foundation at Laie Marriott
Wafflemat (used) vs. Micro Piles (considered)

The production, transportation, and use of concrete is one of the largest contributors of CO2 emissions during the construction of a building. The following summarizes the carbon footprint of the Wafflemat foundation system used versus the micro pile foundation initially considered for the Laie Marriott, Oahu, Hawaii, built in June 2014.

Size of foundation: Approximately 38,000 sf
Micro pile specs: 225 piles, 10" diameter, 70 feet deep to support 8" slab
Wafflemat specs: 8,000 12" x 19" x 19" Waffleboxes to support 6" slab
Concrete estimated in micro pile design: 2,302 cy
Concrete used in Wafflemat design: 1,872 cy

Project Data	Micro Pile	Wafflemat	Difference	Where Used
CO2 lbs related to production of:				
- Cement	1,367,284	1,085,596	- 281,688	Manufacture of product
- Waffleboxes	0	805	805	Manufacture of product
CO2 lbs related to transport of:				
- Cement	68,364	54,280	- 14,084	Ship
- Concrete	44,437	35,282	- 9,155	Truck (Local)
- Waffleboxes	0	1,782	1,782	Ship
Emissions in tons:	**740**	**589**	**- 151**	**20%**

Engineering Factors:

Item	Unit	Factor	Source
Cement	lbs CO2/pound	1	EPA AP42
Concrete	Lbs per yard	3861	ASTM
Iron rebar	Lbs CO2/pound	1.06	IPCC
Steel Cable	Lbs CO2/pound	1.06	IPCC
Diesel truck	Lbs CO2/lb-mile	0.0001	Estimate
Diesel Ship	Lbs CO2/lb-mile	0.00002	Maresk
Electricity	CO2 lbs/kw per hour	0.45	PG&E
Natural Gas	CO2 lbs/therm	13.5	PG&E
Diesel Emis.	Lbs/gallon	26	GREET Model
NRG	Kw-hr	0.15	Estimate